Aron Beatty, Esquire
Regulatory Counsel IV,
Regulatory Law

Duquesne Light Company
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Harrisburg, PA 17102

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September 30, 2025

VIA ELECTRONIC FILING

Matthew L. Homsher, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

Re: Duquesne Light Company's Energy Efficiency and Conservation Phase IV Plan Preliminary Annual Report - Program Year 16
Docket No. M-2020-3020818

Dear Secretary Homsher:

Enclosed for filing, please find the Final Annual Report for Program Year 16 of Duquesne Light Company's Energy Efficiency and Conservation Phase IV Plan.

Should you have any questions, please do not hesitate to contact me or Dave Defide, Senior Manager of Customer Programs, at 412-393-6107.

Respectfully Submitted,

Aron J. Beatty, Esquire

PA ID #86625

Enclosures
CC: Certificate of Service

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served upon the following persons, in the manner indicated, in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant):

ELECTRONIC MAILING

Office of Consumer Advocate
555 Walnut Street Forum Place, 5th Floor
Harrisburg, PA 17101-1923
Ra-oca@paoca.org

Bureau of Investigation & Enforcement
Allison Kaster
Commonwealth Keystone Building
400 North Street, 2nd Floor West
PO Box 3265
Harrisburg, PA 17105-3265
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Office of Small Business Advocate
555 Walnut Street. 1st Floor
Harrisburg, PA 17101
Ra-sba@pa.gov

Dated: September 30, 2025

Respectfully Submitted,

Aron J. Beatty, Esquire

PA ID #86625

Final Annual Report to the Pennsylvania Public Utility Commission Phase IV of Act 129

Program Year 16
(June 1, 2024-May 31, 2025)

For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Prepared for:

Duquesne Light Company

Submitted by:

Guidehouse Inc.
1676 International Drive, Suite 800
McLean, VA 22102

September 30, 2025

guidehouse.com

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Acronyms

AHRI	Air Conditioning, Heating, and Refrigeration Institute
C&I	Commercial and Industrial
CDD	Cooling Degree Day
CHP	Combined Heat and Power
CSP	Conservation Service Provider or Curtailment Service Provider
CV	Coefficient of Variation
DLC	Direct Load Control
DDR	Dispatchable Demand Response
EAP	Energy Association of Pennsylvania
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE&C	Energy Efficiency and Conservation
EFLH	Equivalent Full Load Hours
EM&V	Evaluation, Measurement, and Verification
ER	Early Replacement
EUL	Effective Useful Life
FCM	Forward Capacity Market
FE	FirstEnergy
GNI	Government, Nonprofit, Institutional
HDD	Heating Degree Day
HER	Home Energy Report
HIM	High-Impact Measure
HOU	Hours of Use
HPWH	Heat Pump Water Heater
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
IDI	In-Depth Interview
IMP	Interim Measure Protocol
kW	Kilowatt
kWh	Kilowatt-hour
LBS	Large Business Solutions
LBVCx	Large Business Virtual Commissioning
LED	Light-Emitting Diode
LI	Low-Income
LI-BEEP	Low-Income Behavioral Energy Efficiency Program
LIEEP	Low-Income Energy Efficiency Program
LLF	Line Loss Factor
MW	Megawatt
MW/yr	Megawatt per year
MWh	Megawatt-hour
MWh/yr	Megawatt-hour per year
NPV	Net Present Value
NTG	Net-to-Gross
NTGR	Net-to-Gross Ratio
O&M	Operation and Maintenance
P4TD	Phase IV to Date
PA PUC	Pennsylvania Public Utility Commission
PJM	Pennsylvania-Jersey-Maryland Interconnection LLC

PMRS	Program Management and Reporting System (Duquesne's Tracking Database)
POP	Point-of-Purchase
PSA	Phase IV to Date Preliminary Savings Achieved; equal to VTD + PYRTD
PSA+CO	PSA Savings Plus Carryover from Phase III
PY	Program Year (e.g., PY13, from June 1, 2021, to May 31, 2022)
PYRTD	Program Year Reported to Date
PYVTD	Program Year Verified to Date
R-BEEP	Residential Behavioral Energy Efficiency Program
RCT	Randomized Control Trial
RDIP	Residential Downstream Incentives Program
ROB	Replace on Burnout
RPM	Reliability Pricing Model
RTD	Phase IV to Date Reported Gross Savings
RTO	Regional Transmission Organization
RUL	Remaining Useful Life
SBDI	Small Business Direct Install
SBS	Smal Business Solutions
SBVCx	Small Business Virtual Commissioning
SO	Spillover
SWE	Statewide Evaluator
TA	Trade Ally
TRC	Total Resource Cost
TRM	Technical Reference Manual
VTD	Phase IV to Date Verified Gross Savings
WACC	Weighted Average Cost of Capital

Types of Savings

Gross Savings: The change in energy consumption or peak demand that results directly from program-related actions taken by participants in an energy efficiency and conservation (EE&C) program, regardless of why they participated.

Net Savings: The total change in energy consumption or peak demand that is attributable to an EE&C program. Depending on the program delivery model and evaluation methodology, the net savings estimates may differ from the gross savings estimate due to adjustments for the effects of free riders, changes in codes and standards, market effects, participant and nonparticipant spillover, and other causes of changes in energy consumption or demand not directly attributable to the EE&C program.

Reported Gross: Also referred to as ex ante (Latin for beforehand) savings. The energy and peak demand savings values calculated by the electric distribution company (EDC) or its program implementation conservation service providers (ICSPs) and stored in the program tracking system.

Unverified Reported Gross: The Phase IV Evaluation Framework allows EDCs and the evaluation contractors the flexibility to not evaluate each program every year. If an EE&C program is being evaluated over a multi-year cycle, the reported savings for a program year where evaluated results are not available are characterized as unverified reported gross until the impact evaluation is completed and verified savings can be calculated and reported.

Verified Gross: Also referred to as ex post (Latin for from something done afterward) gross savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after the gross impact evaluation and associated measurement and verification efforts have been completed.

Verified Net: Also referred to as ex post net savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after application of the results of the net impact evaluation. Typically calculated by multiplying the verified gross savings by a net-to-gross (NTG) ratio (NTGR).

Annual Savings: Energy and demand savings expressed on an annual basis, or the amount of energy or peak demand an EE&C measure or program can be expected to save over the course of a typical year. Annualized savings are noted as MWh/yr or MW/yr. The Pennsylvania technical reference manual (TRM) provides algorithms and assumptions to calculate annual savings, and Act 129 compliance targets for consumption reduction are based on the sum of the annual savings estimates of installed measures or behavior change.

Lifetime Savings: Energy and demand savings expressed in terms of the total expected savings over the useful life of the measure. Typically calculated by multiplying the annual savings of a measure by its effective useful life (EUL). The Total Resource Cost (TRC) Test uses savings from the full lifetime of a measure to calculate the cost-effectiveness of EE&C programs.

Program Year Reported to Date (PYRTD): The reported gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year. Program Year to Date (PYTD) values for energy efficiency will always be reported gross savings in a semiannual or preliminary annual report.

Program Year Verified to Date (PYVTD): The verified gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year as determined by the impact evaluation findings of the independent evaluation contractor.

Phase IV to Date (P4TD): The energy and peak demand savings achieved by an EE&C program or portfolio within Phase IV of Act 129. Reported in several permutations described below.

Phase IV to Date Reported (RTD): The sum of the reported gross savings recorded to date in Phase IV of Act 129 for an EE&C program or portfolio.

Phase IV to Date Verified (VTD): The sum of the verified gross savings recorded to date in Phase IV of Act 129 for an EE&C program or portfolio, as determined by the impact evaluation finding of the independent evaluation contractor.

Phase IV to Date Preliminary Savings Achieved (PSA): The sum of the verified gross savings (VTD) from previous program years in Phase IV where the impact evaluation is complete plus the reported gross savings from the current program year.

Phase IV to Date Preliminary Savings Achieved + Carryover (PSA+CO): The sum of the verified gross savings from previous program years in Phase IV plus the reported gross savings from the current program year plus any verified gross carryover savings from Phase III of Act 129. This value is the best estimate of an EDC’s progress toward the Phase IV compliance targets.

Phase IV to Date Verified + Carryover (VTD + CO): The sum of the verified gross savings recorded to date in Phase IV plus any verified gross carryover savings from Phase III of Act 129.

DUQUESNE LIGHT CO.

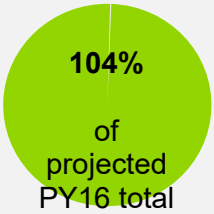
Guidehouse

PORTFOLIO

Duquesne Light offers 17 energy efficiency programs to nonresidential, residential, and low-income customers

Reported Energy Savings

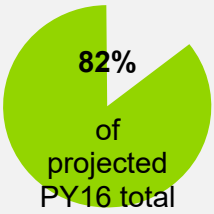
Phase IV has so far been reported to save **339,873 MWh** (VTD+CO)



PY16 saved **72,031 MWh/yr**

Reported Demand Savings

Phase IV has so far been reported to save **58.95 MW** (VTD)



PY16 saved **13.54 MW/yr**

PY16 Participation

A total of **328,857** participants:

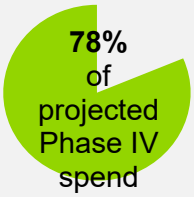
35,668 Low Income

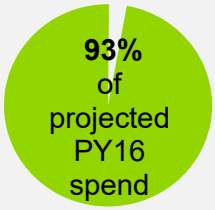
292,802 Residential

387 Nonresidential

Actual Expenditures ($1,000)

Phase IV expenditures: **$75,096**





PY16 expenditures: **$16,139**

1. Introduction

Pennsylvania Act 129 of 2008, signed on October 15, 2008, mandated energy savings and demand reduction goals for the largest electric distribution companies (EDCs) in Pennsylvania for Phases I (2008 through 2013), II (2013 through 2016), and III (2016 through 2021). In late 2020, each EDC filed a new energy efficiency and conservation (EE&C) plan with the Pennsylvania Public Utility Commission (PA PUC) detailing the proposed design of its portfolio for Phase IV. These plans were updated based on stakeholder input and subsequently approved by the PUC in 2021.

Implementation of Phase IV of the Act 129 programs began on June 1, 2021. This report documents the progress and effectiveness of the Phase IV EE&C accomplishments for Duquesne Light Company (Duquesne Light) in program year 16 (PY16), as well as the cumulative accomplishments of the Phase IV programs since inception. This report additionally documents the energy savings carried over from Phase III. The Phase III carryover savings count toward EDC savings compliance targets for Phase IV.

This report details the participation, spending, reported gross, verified gross energy (MWh) and peak demand (MW), and verified net impacts of the energy efficiency programs in PY16. Compliance with Act 129 savings goals are ultimately based on verified gross savings. This report also includes estimates of cost-effectiveness accorded to the Total Resource Cost (TRC) Test.[1] Duquesne Light has retained Guidehouse Inc. (Guidehouse) as an independent evaluation contractor for Phase IV of Act 129. Guidehouse is responsible for the measurement and verification of the savings and calculation of gross verified and net verified savings.

Guidehouse also performed a process evaluation to examine the design, administration, implementation, and market response to the EE&C program. This report presents the key findings and recommendations identified by the process evaluation and documents any changes to EE&C program delivery considered based on the recommendations.

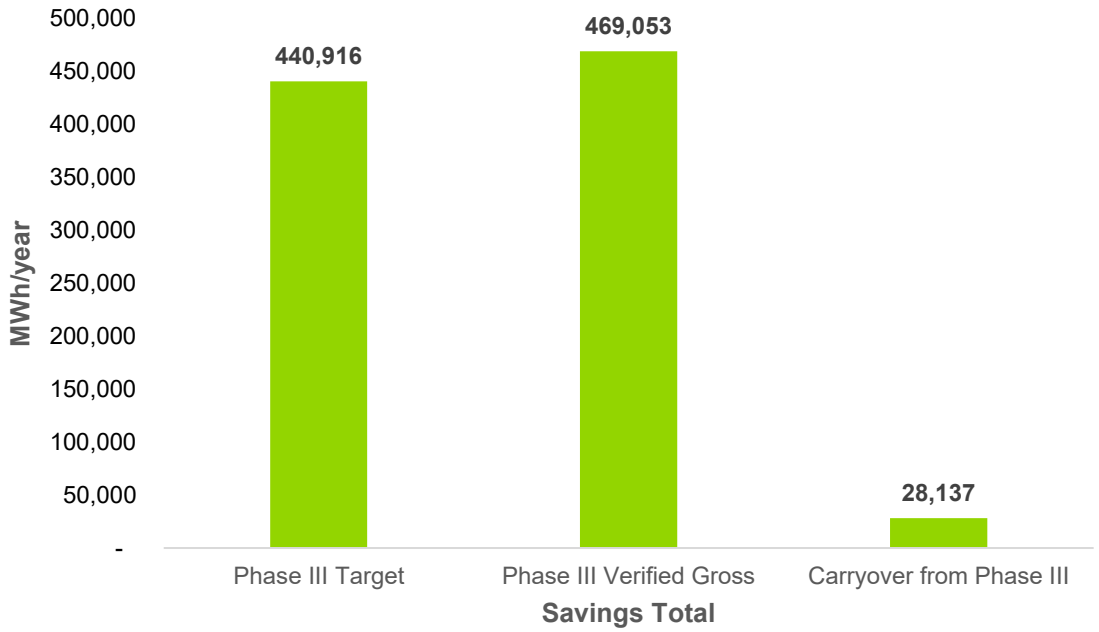
[1] The Pennsylvania TRC Test for Phase I was adopted by PUC Order at Docket No. M-2009-2108601 on June 23, 2009 (*2009 PA TRC Test Order*). The TRC Test Order for Phase I later was refined in the same docket on August 2, 2011 (*2011 PA TRC Test Order*). The 2013 TRC Order for Phase II of Act 129 was issued on August 30, 2012. The 2016 TRC Test Order for Phase III of Act 129 was adopted by PUC Order at Docket No. M-2015-2468992 on June 11, 2015. The 2021 TRC Test Order for Phase IV of Act 129 was adopted by PUC Order at Docket No. M-2019-3006868 on December 19, 2019.

2. Summary of Achievements

2.1 Carryover Savings from Phase III of Act 129

Duquesne Light has a total of 28,137 MWh/yr of portfolio-level carryover savings from Phase III. Figure 2-1 compares Duquesne Light's Phase III verified gross savings total with the Phase III compliance target to illustrate the carryover calculation.

Figure 2-1: Carryover Savings from Phase III of Act 129



Source: SWE Phase III Report[2]

The Commission's Phase IV Implementation Order[3] also allowed EDCs to carry over savings in excess of the Phase III low-income (LI) savings goal.[4] With the carrying over of 3,266 MWh/yr of Phase II LI savings, Duquesne Light achieved the Phase III compliance target. However, with 23,128 MWh/yr of VTD LI energy savings achieved during Phase III, Duquesne Light does not have LI carryover energy savings from Phase III to Phase IV. Figure 2-2 shows the calculation of carryover savings for the LI customer segment.

[2] Pennsylvania Statewide Evaluator, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

[3] Pennsylvania Public Utility Commission, *Energy Efficiency and Conservation Program Implementation Order* at Docket No. M-2020-3015228 (*Phase IV Implementation Order*), entered June 18, 2020.

[4] Proportionate to those savings achieved by dedicated LI programs in Phase III.

Figure 2-2: LI Carryover from Phase III

Source: SWE Phase III Report[5]

2.2 Phase IV Energy Efficiency Achievements to Date

Phase IV energy savings targets (MWh) were established at the meter level and peak demand reduction targets (MW) were set at the system level. Accordingly, the MWh totals in this report are presented at the meter level, while peak demand savings are adjusted for transmission and distribution losses to reflect system-level savings. Since the beginning of PY16 on June 1, 2024, Duquesne Light has claimed:

- 66,024 MWh/yr of reported gross electric energy savings (PYRTD)
- 12.40 MW/yr of reported gross peak demand savings (PYRTD)
- 72,031 MWh/yr of verified gross electric energy savings (PYVTD)
- 13.54 MW/yr of verified gross peak demand savings (PYVTD)

Since the beginning of Phase IV of Act 129 on June 1, 2021, Duquesne Light has achieved:

- 292,875 MWh/yr of reported gross electric energy savings (RTD)
- 54.57 MW/yr of reported gross peak demand savings (RTD)
- 311,736 MWh/yr of verified gross electric energy savings (VTD)
- 58.95 MW/yr of verified gross peak demand savings (VTD)
    - This represents 95% of the May 31, 2026, peak demand savings compliance target of 62 MW/yr

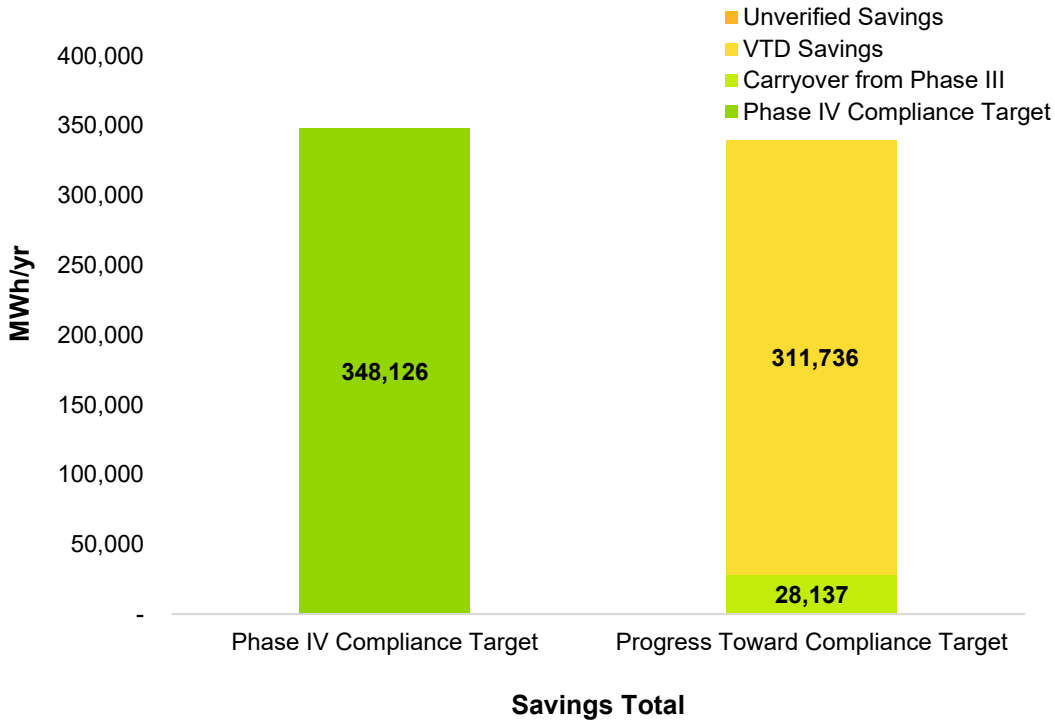
[5] Pennsylvania Statewide Evaluator, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

Including carryover savings from Phase III, Duquesne Light has achieved:

- 339,873 MWh/yr of VTD + portfolio-level carryover energy savings
    - This represents 98% of the May 31, 2026, energy savings compliance target of 348,126 MWh/yr.

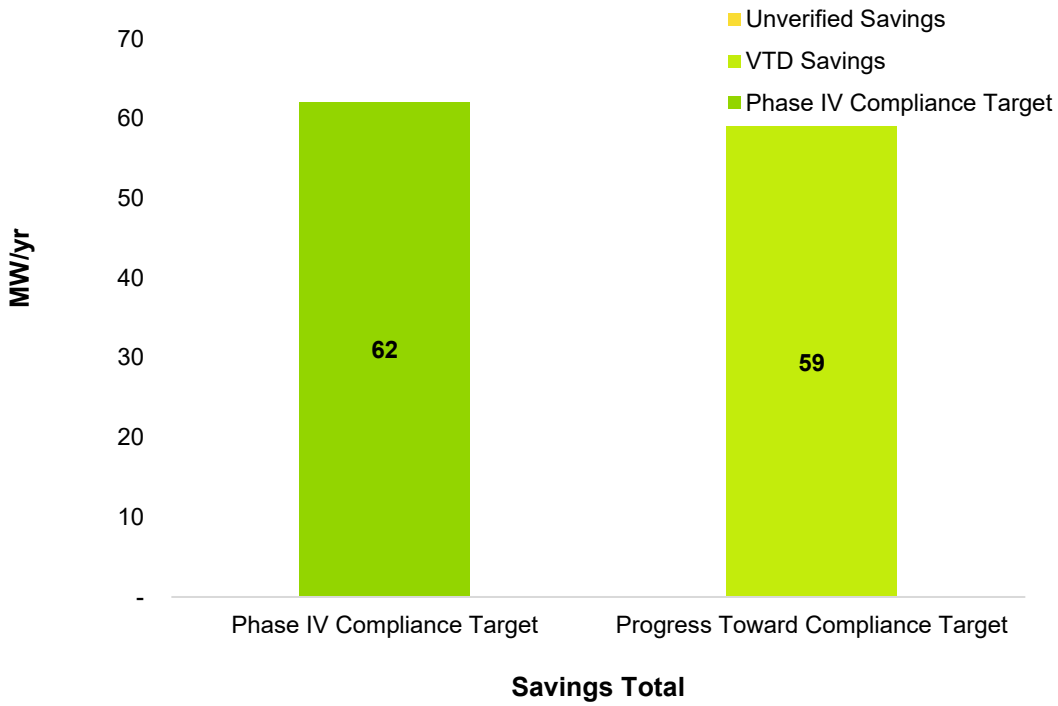
Figure 2-3 summarizes Duquesne Light's progress toward the Phase IV MWh portfolio compliance target, and Figure 2-4 summarizes progress toward the Phase IV MW portfolio compliance target.

Figure 2-3: EE&C Plan Performance Toward Phase IV Portfolio Compliance Target



Source: Guidehouse analysis

Figure 2-4: EE&C Plan Performance Toward Phase IV Portfolio Compliance Target

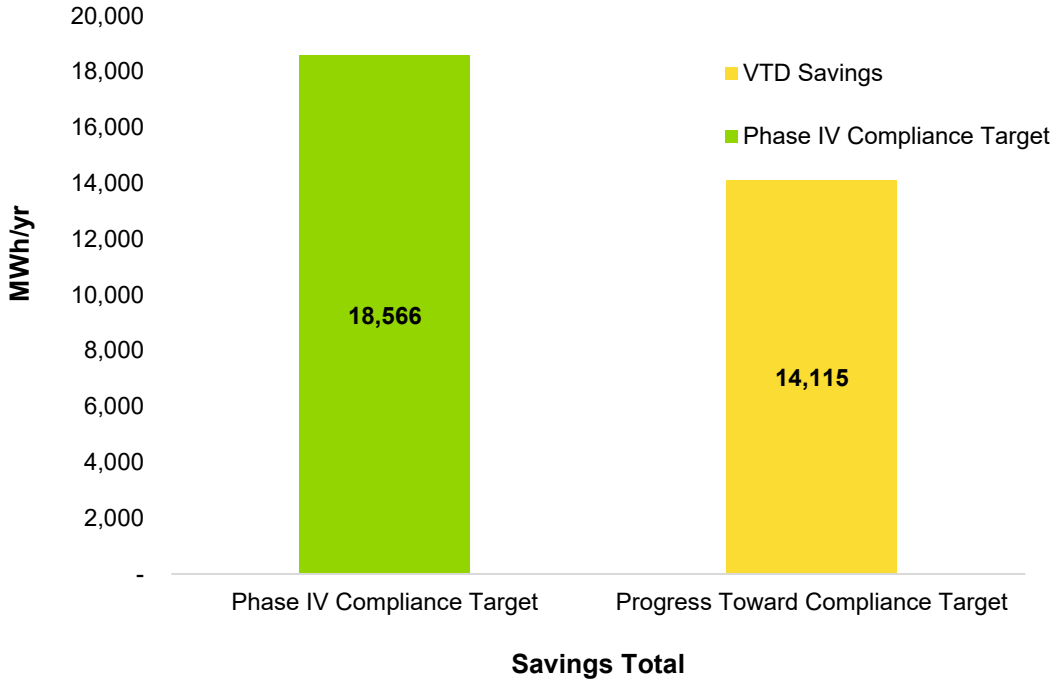


Source: Guidehouse analysis

The Phase IV Implementation Order directed EDCs to offer conservation measures to the LI customer segment based on the proportion of electric sales attributable to LI households. The proportionate number of measures targeted for Duquesne Light is 8.4%. Duquesne Light offers a total of 90 EE&C measures to its residential and nonresidential customer classes. There are 34 measures available to the LI customer segment at no cost to the customer. This represents 37.8% of the total measures offered in the EE&C plan and exceeds the proportionate number of measures target.

The PA PUC also established an LI energy savings target of 5.3% of the portfolio savings goal. The LI savings target for Duquesne Light is 18,566 MWh/yr and is based on verified gross savings. Figure 2-5 compares the VTD performance for the LI customer segment with the Phase IV savings target. Based on the latest available information, Duquesne Light has achieved 76% of the Phase IV LI energy savings target.

Figure 2-5: EE&C Plan Performance Toward Phase IV LI Compliance Target



Source: Guidehouse analysis

2.2.1 Phase IV Performance, Multifamily Housing

Duquesne Light has achieved 469 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing, including 195 MWh/yr of verified gross electric energy savings (PYVTD) from LI households. For Phase IV, Duquesne Light has achieved 2,477 MWh/yr of verified gross electric energy savings (VTD) for multifamily housing, including 1,838 MWh/yr of verified gross electric energy savings (VTD) from LI households. These savings are reported under the Small Business Direct Install (SBDI) program and Large Business Solutions – Commercial program. The LI household savings are also reported under the Residential LI sector.

2.3 Phase IV Performance by Customer Segment

Table 2-1 presents the participation, savings, and spending by customer sector for PY16. The residential, small commercial and industrial (C&I), and large C&I sectors are defined by EDC tariff, and the residential LI and governmental/educational/nonprofit sector were defined by statute (66 Pa. C.S. § 2806.1). The residential LI segment is a subset of the residential customer class and the government, nonprofit, institutional (GNI) segment includes customers who are part of the small C&I or large C&I rate classes. The savings, spending, and participation values for the LI segments have been removed from the parent sectors in Table 2-1. Pursuant to the Commission's Implementation Order for Phase IV, Duquesne Light will not offer a specialized program but will report the savings associated with the GNI customers participating in the nonresidential programs. Table 2-1 shows the savings, spending, and participation values for the GNI segment.

Table 2-1: PY16 Summary Statistics by Customer Segment

Parameter	Residential (Non-LI)	LI*	Small C&I	Large C&I	GNI	Total
Number of participants**	292,802	35,668	143	125	119	328,857
PYVTD MWh/yr	21,749	3,308	5,623	23,446	17,904	72,031
PYVTD MW/yr	3.21	0.38	1.03	5.17	3.75	13.54
Incentives ($1,000)	$1,523	$39	$554	$1,458	$1,350	$4,925

* The low income segment is reporting savings from residential, small commercial, and large commercial programs.
**See Section 2.4 for the per program definition of a participant.
Source: Guidehouse analysis

Table 2-2 summarizes plan performance by sector since the beginning of Phase IV.

Table 2-2: Phase IV Summary Statistics by Customer Segment

Parameter	Residential (Non-LI)	LI*	Small C&I	Large C&I	GNI**	Total
Number of Participants***	874,456	123,174	3,371	1,088	893	1,002,982
VTD MWh/yr	62,628	14,115	84,147	94,349	56,496	311,736
VTD MW/yr	10.68	1.65	19.09	16.37	11.16	58.94
Incentives ($1,000)****	$4,077	$386	$12,189	$7,022	$7,197	$30,872

* The low income segment is reporting savings from residential, small commercial, and large commercial programs.
**PY13 and PY14 reports did not remove the number of GNI participants or the incentives from the small and large C&I segments. Based on SWE feedback, the number of participants and incentives have been updated in the PY16 report, removing any GNI participants or incentives from non-GNI segments.
***See Section 2.4 for the per program definition of a participant.
****PY13 and PY14 incentives included incentives beyond what was provided directly to customers and reported within Duquesne Light's tracking data. The incentives have been updated in the PY16 report to solely reflect the incentives provided to customers. Downstream Incentives reported $60 for incentives in PY14; however, the tracking data indicates the incentives were $87, resulting in an increase in the Phase IV residential incentives.
Source: Guidehouse analysis

2.4 Summary of Participation by Program

Participation is defined differently for certain programs and program components depending on the program delivery channel and data tracking practices. The nuances of the participant definition vary by program and are summarized by program in the following bullets. Table 2-3 provides the current participation totals for PY16 and Phase IV:

- For customers participating in the Rebate and Audit component of the Residential Downstream Incentives Program (RDIP), it is the number of distinct account numbers in the program tracking data within a given program year. For the Kits component of RDIP, it is the number of kits distributed within a given program year.

- For the Residential Midstream Incentives Program (RMIP), it is the number of distinct account numbers in the program tracking data within a given program year.
- For the Residential Upstream Incentives Program (RUIP), participation cannot be accurately collected due to the nature of the program and therefore are not counted.
- For the Residential Appliance Recycling Program (RARP), it is the number of distinct measures in the program tracking data within a given program year.
- For the Low-Income Energy Efficiency Program (LIEEP), customers participating in the Audit component, it is the number of distinct account numbers in the tracking data within a given program year. For the Kits component of LIEEP, it is the number of kits distributed within a given program year. For the Giveaway component of LIEEP, it is the number of measures distributed within a given year.
- For the Residential and LI Behavior program, it is the number of distinct account numbers in the tracking data within a given program year.
- For SBDI, it is the number of unique participants (defined as unique account numbers).
- For the Small Business Solutions (SBS) and Large Business Solutions (LBS) programs, including industrial, it is the number of unique participants (defined as unique account numbers).
- For the Small Business Midstream Solutions (SBMS) and Large Business Midstream Solutions (LBMS) programs, including industrial, it is the number of unique participants (defined as unique account numbers).
- For the Small Business Virtual Commissioning (SBVCx) and Large Business Virtual Commissioning (LBVCx) programs, it is the number of unique participants (defined as unique account numbers).

Table 2-3: EE&C Portfolio Participation by Program

Program	PY16 Participation	P4TD Participation
Downstream Incentives	56,964	109,437
Midstream Incentives	0	3
Upstream Incentives	N/A	N/A
Appliance Recycling	2,097	7,736
Residential Total	**59,061**	**117,176**
LI Total	**8,804**	**31,619**
Residential Behavior Total	**233,741**	**757,280**
LI Behavior Total	**26,863**	**91,549**
Small Business Direct Install	10	419
Small Business Solutions	157	693
Small Business Midstream Solutions	0	2,801
Small Business Virtual Commissioning	3	49
Commercial - Large Business Solutions	42	171
Industrial - Large Business Solutions	7	37
Commercial - Large Business Midstream Solutions	140	922
Industrial - Large Business Midstream Solutions	28	254

Program	PY16 Participation	P4TD Participation
Large Business Virtual Commissioning	1	12
Nonresidential Total	**388**	**5,358**
Portfolio Total	**328,857**	**1,002,982**

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY16, Guidehouse completed impact evaluations for several program components in the portfolio. Table 2-4 summarizes the realization rates and net-to-gross (NTG) ratios (NTGRs) by evaluation component.

Table 2-4: Impact Evaluation Results Summary

Program and Initiative	Energy Realization Rate	Demand Realization Rate	NTGR
Downstream Incentives	103%	84%	81%
Appliance Recycling	101%	107%	72%
Residential Total	**102%**	**88%**	**86%**
LI Total	**99%**	**101%**	**100%**
Residential Behavior Total	**99%**	**71%**	**100%**
LI Behavior Total	**127%**	**193%**	**100%**
Small Business Direct Install	99%	166%	93%
Small Business Solutions	94%	90%	66%
Small Business Virtual Commissioning	99%	90%	94%
Commercial - Large Business Solutions	96%	106%	90%
Industrial – Large Business Solutions	105%	94%	90%
Commercial - Large Business Midstream Solutions	175%	195%	88%
Industrial - Large Business Midstream Solutions	111%	114%	88%
Large Business Virtual Commissioning	97%	N/A	94%
Nonresidential Total	**113%**	**123%**	**86%**
Portfolio Total	**109%**	**109%**	**87%**

Source: Guidehouse analysis

2.6 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/yr). Each program year, the annual savings achieved by EE&C program activity are recorded as incremental annual, or first-year, savings and added to an EDC's progress toward compliance. Incremental annual savings estimates are presented in Section 2.6.1. Lifetime energy savings incorporate the effective useful life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC Test by program participants when assessing the economics of upgrades and by the SWE when

calculating the emissions benefits of Act 129 programs. Section 2.6.2 presents the lifetime energy savings by program.

2.6.1 Incremental Annual Energy Savings by Program

Table 2-5 presents a summary of the PY16 and Phase IV to date (P4TD) energy savings by program. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. The verified gross savings are adjusted by the energy recent realization rate and the verified net savings are adjusted by both the realization rate and the NTGR.

Table 2-5: Incremental Annual Energy Savings by Program (MWh/yr)

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential Downstream Incentives	13,096	13,437	10,856	22,163	22,187	17,856
Residential Midstream Incentives	-	-	-	7	7	7
Residential Upstream Incentives	-	-	-	6,756	7,456	5,108
Residential Appliance Recycling	1,408	1,422	1,019	5,031	5,344	3,167
Low-Income Energy Efficiency	2,431	2,417	2,417	9,922	9,424	9,424
Residential Behavioral Savings	6,956	6,891	6,891	28,148	27,635	27,635
Low-Income Residential Behavioral	549	696	696	2,539	2,853	2,853
Small Business Direct Install	473	469	436	11,212	10,428	9,789
Small Business Solutions	5,936	5,558	3,668	28,167	29,645	20,564
Small Business Midstream Solutions	-	-	-	52,861	57,431	39,383
Small Business Virtual Commissioning	101	100	94	2,860	2,804	2,657
Commercial Large Business Solutions	22,139	21,206	19,054	50,495	50,643	35,446
Industrial Large Business Solutions	2,469	2,585	2,322	29,338	29,755	14,349
Large Business Midstream Solutions – Commercial	8,797	15,431	13,579	22,563	31,495	25,435
Large Business Midstream Solutions – Industrial	1,426	1,583	1,393	16,649	20,580	14,478

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Large Business Virtual Commissioning	244	238	223	4,165	4,051	3,949
Portfolio Total	**66,024**	**72,031**	**62,649**	**292,875**	**311,736**	**232,101**

Source: Guidehouse analysis

The previously reported VTD savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- RARP: SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the incorrect cooling degree days (CDDs) and heating degree days (HDDs) in the evaluation of savings. This caused a negligible effect on energy savings but was incorporated into future evaluations for this program. These verified gross savings are attributed to the Residential (Non-LI) sector VTD savings in Table 2-2.
- SBMS: In the PY13 final annual report, 3,238 MWh/yr of savings were reported but not verified. Those savings have since been verified with an energy realization rate of 114% and an NTGR of 67%, which yields an additional 3,708 MWh/yr of gross verified energy savings and an additional 2,485 MWh/yr of net verified energy savings. These verified gross savings are attributed to the Small C&I sector VTD savings in Table 2-2.
- LBMS: In the PY13 final annual report, 569 MWh/yr of savings were reported but not verified. Those savings have since been verified with an energy realization rate of 23% and an NTGR of 67%, which yields an additional 109 MWh/yr of gross verified energy savings and an additional 73 MWh/yr of net verified energy savings. These verified gross savings are attributed to the Large C&I sector VTD savings in Table 2-2

2.6.2 Lifetime Energy Savings by Program

Table 2-6 presents the PYTD and P4TD lifetime energy savings by program. Lifetime energy savings are calculated by multiplying the annual energy savings by the EUL. Per the PA 2016 TRC Order, the measure EUL does not exceed 15 years for any measure in the portfolio. Early replacement (ER) measures are subject to a dual baseline calculation, leading to modified lifetime savings. For these measures, savings relative to the in-place baseline equipment are used for the remaining useful life (RUL) of the base equipment. After the RUL, savings related to code equipment are used for the remainder of the efficient measure’s EUL.

Table 2-6: Lifetime Energy Savings by Program (MWh)

Program Name	PYVTD Gross Lifetime (MWh)	PYVTD Net (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential Downstream Incentives	152,573	123,267	235,172	189,151
Residential Midstream Incentives	-	-	104	104
Residential Upstream Incentives	-	-	83,981	56,308
Residential Appliance Recycling	6,678	4,785	25,290	14,984
Low-Income Energy Efficiency	19,015	19,015	63,019	63,019
Residential Behavioral Savings	13,782	13,782	52,752	52,752
Low-Income Residential Behavioral	1,392	1,392	5,213	5,213
Small Business Direct Install	7,036	6,543	156,307	146,407
Small Business Solutions	81,475	53,773	436,476	303,156
Small Business Midstream Solutions	-	-	861,370	590,677
Small Business Virtual Commissioning	801	753	41,364	39,204
Commercial Large Business Solutions	311,061	279,504	747,943	524,962
Industrial Large Business Solutions	38,770	34,837	445,689	214,933
Large Business Midstream Solutions - Commercial	231,461	203,686	472,395	381,515
Large Business Midstream Solutions - Industrial	23,751	20,901	308,698	217,164
Large Business Virtual Commissioning	1,901	1,787	59,094	57,683
Portfolio Total	**889,695**	**764,025**	**3,994,866**	**2,857,233**

Source: Guidehouse analysis

The previously reported VTD lifetime savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- No changes have been made since the PY13 annual report was submitted.

2.7 Summary of Peak Demand Reduction Impacts by Program

Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2:00 p.m. to 6:00 p.m. EDT on non-holiday weekdays from June through August. Peak demand impacts from energy efficiency in this report are presented at the system level, meaning they have been adjusted to account for transmission and distribution losses. Duquesne Light uses the following line loss percentages/multipliers by sector:

- Residential = 1.0741
- Small and Large C&I = 1.0741
- Large C&I High Voltage = 1.0081

Table 2-7 presents a summary of the peak demand impacts by energy efficiency program through the current reporting period.

Table 2-7: Peak Demand Savings by Energy Efficiency Program (MW/yr)

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Downstream Incentives	1.71	1.43	1.16	3.70	3.26	2.59
Residential Midstream Incentives	-	-	-	0.00	0.00	0.00
Residential Upstream Incentives	-	-	-	0.97	1.40	1.02
Residential Appliance Recycling	0.37	0.40	0.29	1.20	1.29	0.77
Low-Income Energy Efficiency	0.19	0.20	0.20	0.95	0.93	0.93
Residential Behavioral Savings	1.95	1.38	1.38	5.48	4.72	4.72
Low-Income Residential Behavioral	0.07	0.14	0.14	0.26	0.42	0.42
Small Business Direct Install	0.06	0.11	0.10	1.89	1.98	1.85
Small Business Solutions	1.15	1.04	0.68	6.05	7.11	4.99
Small Business Midstream Solutions	-	-	-	11.39	12.78	8.78
Small Business Virtual Commissioning	0.00	0.00	0.00	0.49	0.54	0.51
Commercial Large Business Solutions	4.44	4.71	4.23	10.30	10.53	7.51
Industrial Large Business Solutions	0.30	0.29	0.26	3.10	3.13	1.54
Large Business Midstream Solutions – Commercial	1.75	3.42	3.01	4.38	6.29	5.14
Large Business Midstream Solutions – Industrial	0.38	0.43	0.38	3.95	3.99	2.86
Large Business Virtual Commissioning	-	-	-	0.43	0.59	0.58
Portfolio Total	**12.40**	**13.54**	**11.82**	**54.57**	**58.95**	**44.20**

Source: Guidehouse analysis

The previously reported VTD savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- RARP: SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the wrong CDDs and HDDs in the evaluation of savings. This caused a negligible effect to demand savings but was incorporated into future evaluations

for this program. These verified gross savings are attributed to the Residential (Non-LI) sector VTD savings in Table 2-2.

- SBMS: In the PY13 final annual report, 0.61 MW/yr of savings were reported but not verified. Those savings have since been verified with a demand realization rate of 154% and an NTGR of 67%, which yields an additional 0.95 MW/yr of gross verified demand savings and an additional 0.63 MW/yr of net verified demand savings. These verified gross savings are attributed to the Small C&I sector VTD savings in Table 2-2.
- LBMS: In the PY13 final annual report, 0.10 MW/yr of savings were reported but not verified. Those savings have since been verified with a demand realization rate of 37% and an NTGR of 67%, which yields an additional 0.036 MW/yr of gross verified demand savings and an additional 0.024 MW/yr of net verified demand savings. These verified gross savings are attributed to the Large C&I sector VTD savings in Table 2-2.

2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market

The Approved EE&C Plan called for Duquesne Light to nominate up to 2 MW of capacity in the PJM Reliability Pricing System (RPS) Base Residual Auction (BRA) for the 2025/2026 delivery year. Federal Energy Regulatory Commission (FERC) postponed this auction from June 14, 2023 to July 17, 2024 (Y16 Q1). The PY15 Annual Report (on pdf page 20) describes this.[6]

The Capacity Resource: Energy Efficiency Capacity Resource Commercial Aggregation (timeline)

- Initial Measurement and Verification Plan submitted PJM June 17, 2024
- PJM Market Monitor’s (Monitoring Analytics) 9-Questions June 21, 2024
- Response to Monitoring Analytics June 26, 2025
- The 2025/2026 BRA was held July 17-23, 2024
- Post-Installation Measurement and Verification Report submitted 9/11/2024

Approved nomination was 1.0 MW; Annual 0.6 MW, Summer 0.4 MW. The measured capacity comes from 24 projects (17-Small C&I and 7-Large Commercial), all were interior lighting projects, all had incentives ≥$5,000 and so were 100% site-verified. Based on Summer kW reduction total contributions, the auction proceeds will be credited back to surcharge balancing accounts; 47% going to Small Business and 53% to Large Commercial accounts. Actual compensation is to be credited in PY17.

2.8 Summary of Fuel Switching Impacts

Act 129 allows EDCs to achieve electric savings by converting electric equipment to non-electric equipment. Table 2-8 summarizes key fuel switching metrics in PY16 and to date in Phase IV.

[6] The 2025/2026 BRA, originally scheduled to open 6/14/2023 was delayed until 7/17/2024. Duquesne Light met with PJM on 5/9/24, PJM provided revised energy efficiency acceptable Installation Periods for the 2025/2026 BRA. DLC filled its Initial M&V Plan with PJM on 6/17/2024, this was accepted by PJM on 6/28/2024. Duquesne Light’s 2025/2026 BRA nomination was submitted during the auction window 7/17/24 to 7/23/24 and was accepted. DLC will report the PJM BRA nomination that occurred during the Act 129 PY16 when the activity occurred in its PY16 annual report.

Table 2-8: Fuel Switching Summary

Metric	PY16
Fuel Switching Measures Offered	None
Fuel Switching Measures Implemented	0
VTD Energy Savings Achieved via Fuel Switching (MWh/yr)	N/A
P4TD Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	N/A
P4TD Incentive Payments for Fuel Switching Measures ($1,000)	N/A

Source: Guidehouse analysis

2.9 Summary of Renewable Energy Impacts

Act 129 allows EDCs to incentivize behind-the-meter solar photovoltaics and other renewable energy generation measures that offset the need for electricity from the grid. Table 2-9 summarizes the energy savings, peak demand reduction, and incentive totals for renewable energy measures in PY16 and Phase IV to date.

Table 2-9: Renewables Summary

Metric	PY16	P4TD
Renewable Energy Measures Implemented	14	16
VTD Residential Energy Savings Achieved via Renewables (MWh/yr)	-	-
VTD Residential Peak Demand Savings Achieved via Renewables (MW/yr)	-	-
Incentive Payments for Residential Renewable Energy Measures ($1,000)	$0	$0
VTD Non-Residential Energy Savings Achieved via Renewables (MWh/yr)	6,234	7,119
VTD Non-Residential Peak Demand Savings Achieved via Renewables (MW/yr)	1.90	2.13
Incentive Payments for Non-Residential Renewable Energy Measures ($1,000)	$536	$580

Source: Guidehouse analysis

2.10 Summary of Cost-Effectiveness Results

Table 2-10 presents a detailed breakdown of portfolio finances and cost-effectiveness. TRC benefits in Table 2-10 were calculated using gross verified impacts. Net present value (NPV) PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 2-10: Summary of Portfolio Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$12,994		$48,548	
2	Rebates to Participants and Trade Allies	$6,806		$18,259	
3	Upstream/Midstream Incentives	$ -		$9,348	
4	Material Cost for Self-Install Programs (EE&C Kits)	$1,005		$823	
5	Direct Installation Program Materials and Labor	$1,089		$6,534	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$4,094		$13,584	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$176	$135
8	Administration and Management	$529	$1,072	$1,873	$3,681
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$576	$4,536	$472	$24,998
11	EDC Evaluation Costs	$526		$1,842	
12	SWE Audit Costs	$264		$1,138	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$7,503		$34,315	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$20,497		$82,863	
15	Total NPV Lifetime Electric Energy Benefits	$28,403		$109,589	
16	Total NPV Lifetime Electric Capacity Benefits	$12,748		$51,374	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$1,896		$8,394	
18	Total NPV Lifetime Fossil Fuel Impacts	$(2,605)		$(12,334)	
19	Total NPV Lifetime Water Impacts	$1,340		$2,684	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$41,782		$159,707	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.04		1.93	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

TRC benefit-cost ratios are calculated by comparing the total NPV TRC benefits and the total NPV TRC costs. It is important to note that TRC costs are materially different from the EDC spending and rate recovery tables presented later in the report. TRC costs include estimates of the full cost incurred by program participants to install efficient equipment, not just the portion covered by the EDC rebate. Appendix D shows the TRC ratios by program and for the portfolio.

2.11 Comparison of Performance with Approved EE&C Plan

Table 2-11 presents PY16 expenditures compared with the budget estimates set forth in the EE&C plan for PY16 and P4TD. PY16 values are presented in 2024 dollars and P4TD values are presented in 2021 dollars. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 2-11: Comparison of Expenditures with Phase IV EE&C Plan ($1,000)

Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
PY16 Portfolio	$17,361	$16,139	0.93
P4TD	$77,787	$75,096	0.97

Source: Guidehouse analysis

Table 2-12 compares PY16 and P4TD verified gross program savings with the energy savings projections set forth in the EE&C plan.

Table 2-12: Comparison of Actual Program Savings with EE&C Plan Projections

Savings	EE&C Plan Projections	VTD Gross MWh Savings	Ratio (Actual/Plan)
PY16 Portfolio MWh	69,136	72,031	1.04
P4TD MWh	290,397	311,736	1.07
PY16 Portfolio MW	16.46	13.54	0.82
P4TD MW	58.67	58.95	1.00

Source: Guidehouse analysis

The following list highlights key reasons programs exceeded or fell short of projected gross energy savings in PY16:

- The CSP peak demand savings methodology for the Residential Behavior program considered only the summer months and applied a slightly different peak demand multiplier than the Guidehouse approach. Energy savings in summer months often differ considerably from average savings for the year, particularly for new waves. This contributed to differences in the reported and verified demand savings estimates
- The Nonresidential Midstream program ran strong in PY14, exceeding both PY15 and PY16 verified savings projections, and ultimately increasing total gross Non-Residential impacts.

2.12 Findings and Recommendations

The impact and process evaluation activities completed by Guidehouse led to specific recommendations for program improvement. Table 2-13 provides the section number for the findings and recommendations of each program. Due to the early stage of programs in the phase, Guidehouse makes no overarching program recommendations in PY16.

Table 2-13: Findings and Recommendations Sections by Program

Program	Findings and Recommendations Section
Residential Downstream Incentives	3.1.7
Residential Midstream Incentives	3.2.7
Residential Upstream Incentives	3.3.7
Residential Appliance Recycling	3.4.7
Residential Low-Income Energy Efficiency	3.5.7
Residential Behavioral	3.6.7
Low-Income Behavioral	3.7.7
Small Business Direct Install	3.8.7
Small Business Solutions	3.9.7
Small Business Midstream Solutions	3.10.7
Small Business Virtual Commissioning	3.11.7
Large Business Solutions	3.12.7
Large Business Midstream Solutions	3.13.7
Large Business Virtual Commissioning	3.14.7

Source: Guidehouse analysis

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY16 along with the outcomes of those activities. Not every program receives an evaluation every year. Table 3-1 provides an impact evaluation overview for Phase IV. Each row indicates how savings from the individual component will be presented in that year's final annual report, where:

V = verified using the results of the impact evaluation completed that year

H = verified using realization rate values from the most recent evaluation activities based on previous years

U = unverified until the results of the impact evaluation are available

Table 3-1: Proposed Gross Impact Overview

Component	PY13	PY14	PY15	PY16	PY17
Residential					
Downstream Incentives	V	H	V	H[7]	V
Midstream Incentives	H	H	H	H[8]	H
Upstream Incentives	V	V	V	V	V
Appliance Recycling	V	H	V	H	H
Low-Income Energy Efficiency	H	V	H	V	H
Residential Behavioral	V	V	V	V	V
Low-Income Behavioral	V	V	V	V	V
Small/Medium C&I					
Small Business Direct Install	V[9] (2-year rolling sample)		V	H	V
Small Business Solutions	Uses a 2-year rolling sample approach				
Small Business Midstream	V	V	H	V	H
Small Business Virtual Commissioning	U	V	V	H	V

[7] In PY16, Guidehouse evaluated the new RDIP customer kit, given the significant amount of savings associated with the component.

[8] RMIP saw limited activity in PY16. Therefore, the program was not verified as originally scheduled.

[9] SBDI showed low participation in the first three quarters of PY13. Guidehouse verified several projects for PY13 and completed a rolling 2-year evaluation of this program in PY14.

Component	PY13	PY14	PY15	PY16	PY17
Large C&I					
Large Business Solutions		Uses a 2-year rolling sample approach			
Large Business Midstream Solutions	V	V	H	V	H
Large Business Virtual Commissioning	U	V	V	H	V

Source: Guidehouse analysis

3.1 Residential Downstream Incentives

RDIP includes incentives for a wide variety of energy efficiency products, including ENERGY STAR appliances; high efficiency heating, cooling, and water heating equipment; and other products. There are three components of the program: customers who received rebates for purchasing and installing energy efficient equipment either at the point-of-purchase (PoP) or following an application (Rebate), customers who received a comprehensive energy efficiency audit (Audit), and customers who received or purchased a kit including energy efficient equipment (Kits).

The CSP for RDIP is CLEAResult. CLEAResult processes the rebate applications as well as performs marketing, verification, and calculation of energy savings for the three components.

For customers participating in the Rebate component of the program, participation is equal to the number of distinct account numbers in the program tracking data within a given program year. Participating customers fill out and submit applications for rebates for qualifying products online or by mail. RDIP also offers PoP rebates through the online marketplace.

Customers participating in the Audit component of the program are counted based on the number of distinct account numbers in the program tracking data within a given year. This component provides comprehensive in-home audits, which, when applicable, directly install measures such as LED bulbs, advanced power strips (APS), faucet aerators, and nightlights. The in-home audits also provide incentives for air sealing; basement, exterior wall, floor, and attic insulation; and additional water heating measures. In lieu of the in-person audit, the program offers an online home energy audit, which allows customers to first obtain instant results by answering questions regarding their home energy use. Customers receive educational materials, and a menu of approved measures and rebate amounts to reduce the cost of replacing inefficient equipment. The online home energy audit simplifies the in-person audit process, should the customer choose to continue in the program. In addition to direct-install measures, which are provided at no cost, the program provides up to a $250 home energy credit for installation of audit-recommended measures.

Finally, the program provides a Kits component in which participation is counted by distinct project numbers. The Kits component includes an education element for elementary, middle, and high school students and teachers that offers educational materials, kits, presentations with hands-on activities, poster contests, and a data collection and tracking process. The data collection and tracking process is used to compile, analyze, and report energy savings. The Education component of the program influences and reinforces the energy efficiency behavioral

changes geared toward students, their families, and teachers.[10] The Kits component also offers a Smart Home Kits to customers for purchase, and in PY16, Duquesne Light started offering a kit to new residential customers. These kits include equipment to help make customer homes more efficient, such as smart thermostats, APS, and outlet gaskets.

3.1.1 Participation and Reported Savings by Customer Segment

Table 3-2 presents the participation counts, reported energy and demand savings, and incentive payments for RDIP in PY16 by customer segment.

Table 3-2: RDIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY16 # of Participants	56,964	56,964
PYRTD MWh/yr	13,096	13,096
PYRTD MW/yr	1.71	1.71
PY16 Incentives ($1,000)	$1,422	$1,422

Source: Guidehouse analysis

3.1.2 Gross Impact Evaluation

Despite not being scheduled to evaluate RDIP in PY16, Guidehouse, in consultation with the SWE, conducted an impact evaluation of the New Customer Kit component. They determined the need for an evaluation given this is the first year the kit is being offered and there are significant savings associated with the offering. Additionally, Guidehouse evaluated an Air Sealing Kit, which was offered in PY15 and included cans of spray foam among other air sealing measures. At the very end of PY15, the SWE issued new guidance on how to calculate savings for canned spray foam that was distributed via kits. Therefore, the PY15 savings for these kits, which equated to 561 MWh/yr and 0.01 MW/yr, were considered unverified until the PY16 impact evaluation. Guidehouse conducted a survey analysis to evaluate both the Air Sealing and New Customer Kits. Table 3-3 shows the reported energy savings in PY16, and Table 3-4 shows the reported demand savings in PY16.

[10] Guidehouse does not report any behavioral savings for the Kits component.

Table 3-3: RDIP Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audits	186	90%	0.21	3%
Kits	5,376	108%	-	0%
Spray Foam	300	108%	1.09	29%
New Customer Kit – Furnace Whistles	187	1%	6.16	147%
New Customer Kit – LEDs	4,618	80%	0.40	9%
New Customer Kit – Nightlights	509	274%	0.92	21%
New Customer Kit – Outlet Gaskets	425	23%	1.95	45%
Rebates	1,495	131%	1.00	14%
Program Total	**13,096**	**103%**	**0.21**	**4%**

Source: Guidehouse analysis

Table 3-4: RDIP Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audits	0.02	90%	0.22	4%
Kits	0.82	99%	-	0%
Spray Foam	0.00	110%	1.09	29%
New Customer Kit – Furnace Whistles	0.10	0%	-	0%
New Customer Kit – LEDs	0.50	76%	0.37	8%
New Customer Kit – Nightlights	-	-	-	0%
New Customer Kit – Outlet Gaskets	0.00	36%	1.95	45%
Rebates	0.26	82%	0.47	6%
Program Total	**1.71**	**84%**	**0.12**	**2%**

Source: Guidehouse analysis

Guidehouse did not plan to evaluate canned spray foam outside of a standard desk review in PY15. However, late in PY15, the SWE issued a guidance memo requiring EDC data gathering

to claim savings for this measure. Guidehouse developed a survey to collect data on these customers early in PY16. However, given the evaluation activities occurred more than a year after customers purchased the kit, the majority of respondents did not recall purchasing the kit or knowing if the kit included spray foam. Both Guidehouse and Duquesne Light were independently contacted by several sampled participants who did not recall purchasing a kit. However, upon further communication with the participant, a plausible explanation was uncovered (i.e., another member of the household might have purchased the kit unbeknown to the person whose name was on the account).

Following consultation with the SWE, Guidehouse included in the analysis any respondents who recalled purchasing the kit. If customers did not recall purchasing the kit or were unsure, Guidehouse excluded their responses from the analysis. Of the customers who recalled purchasing the kit, 91% reported receiving cans of spray foam, and of those that received spray foam, 84% of customers reported using the cans. Duquesne Light included an in-service rate (ISR) of 69% to the reported savings for spray foam. The verified savings for energy and demand were relatively similar to reported savings, resulting in a realization rate of 108% and 110%, respectively.

Similarly to the spray foam analysis, the New Customer Kits analysis did not include customers who responded 'Don't know' to whether they received the kit or to any of the questions regarding whether an individual measure is installed. Nightlights was the only measure within New Customer Kits that resulted in a verified ISR higher than what was applied to reported savings. The other measures – outlet gaskets, furnace whistle, and LEDs – had verified ISRs that were 55%, 82%, and 43% lower than what was reported, respectively. The difference in ISRs resulted in an overall realization rate of 90% for energy and 64% for demand for the kit as a whole.

3.1.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for RDIP in PY16. Table 2-4 shows the NTGR applied to RDIP projects that were carried over from the PY15 NTG evaluation.

3.1.3.1 High-Impact Measure Research

Guidehouse did not conduct high-impact measure (HIM) research for RDIP in PY16.

3.1.4 Verified Savings Estimates

In Table 3-5, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RDIP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-5: Residential Downstream Initiatives PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	13,096	1.71
PYVTD Gross	13,437	1.43
PYVTD Net	10,856	1.16
RTD	22,163	3.70

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	22,186	3.27
VTD Net	17,855	2.59

Source: Guidehouse analysis

3.1.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RDIP in PY16.

3.1.6 Program Finances and Cost-Effectiveness Reporting

Table 3-6 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-6 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-6: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$3,325		$4,365	
2	Rebates to Participants and Trade Allies	$1,461		$2,713	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$1,005		$823	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$859		$829	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$10	$8
8	Administration and Management	$21	$38	$160	$201
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$50	$770	$41	$3,134
11	EDC Evaluation Costs	$32		$111	
12	SWE Audit Costs	$16		$65	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$927		$3,731	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$4,252		$8,095	
15	Total NPV Lifetime Electric Energy Benefits	$4,972		$6,417	
16	Total NPV Lifetime Electric Capacity Benefits	$1,191		$2,249	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$(14)		$(79)	
19	Total NPV Lifetime Water Impacts	$1,150		$2,144	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$7,299		$10,732	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.72		1.33	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-7 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied to the audits component of the program in PY16 comes from the PY15 Net

Impact Evaluation (Section 3.1.3). The NTGR applied to other program components in PY16 comes from PY13 Net Impact Evaluation.

Table 3-7: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$2,686		$3,522	
2	Rebates to Participants and Trade Allies	$1,180		$2,209	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$812		$665	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$561		$509	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$10	$8
8	Administration and Management	$21	$38	$160	$201
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$50	$770	$41	$3,134
11	EDC Evaluation Costs	$32		$111	
12	SWE Audit Costs	$16		$65	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$927		$3,731	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$3,613		$7,253	
15	Total NPV Lifetime Electric Energy Benefits	$4,017		$5,156	
16	Total NPV Lifetime Electric Capacity Benefits	$962		$1,798	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$(11)		$(63)	
19	Total NPV Lifetime Water Impacts	$929		$1,736	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$5,897		$8,628	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.63		1.19	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.1.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-8 provides a summary of Air Sealing and New Customer Kit component findings, along with Duquesne Light's plan to address the recommendations in program delivery.

Table 3-8: RDIP Findings and Recommendations

Findings	Recommendations
Installation Rate	
• Outlet gaskets and furnace whistles have significantly lower installation rates, 18% and 3% respectively, compared the nightlights and LEDs included in the New Customer Kit, 55% and 52% respectively.	• Duquesne Light should consider including additional educational materials to ensure customers understand the measures and how to install and operate them properly. Duquesne Light could also consider including measures that residential customers may be more familiar with (e.g., showerheads).
Duquesne Light Response: Duquesne Light acknowledges the recommendation and takes it under advisement.	
Reported Savings	
• Reported savings for outlet gaskets apply a 23% multiplier on heating savings based on the 2018 SWE Residential Baseline Study. The spray foam analysis resulted in DLC specific heating and cooling multipliers, 7% and 77% respectively, which were applied to the outlet gasket verified savings based on SWE guidance.	• Duquesne Light should apply the heating and cooling multipliers developed through Guidehouse's PY16 spray foam analysis, 7% and 77% respectively, to the reported savings of relevant measures moving forward.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and takes it under advisement.	
Reported Savings	
• Reported savings for furnace whistles apply a 23% discount on heating savings and no discount for cooling savings despite measures only being eligible for savings if applied to central forced-air furnaces, central AC and heat pump systems.	• Duquesne Light should apply heating and cooling multipliers to furnace whistle measures based on the percentage of penetration of central forced-air furnaces, central AC and heat pump systems in Duquesne's service territory, leveraging values from Guidehouse's PY16 spray foam analysis.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and takes it under advisement.	

3.2 Residential Midstream Incentives

RMIP includes rebates for select HVAC, hot water, and auxiliary equipment for residential Duquesne Light customers paid directly to program participating distributors. This program eliminates the burden of customers filling out rebate applications, reducing program participation barriers for customers. For RMIP, participation is equal to the number of distinct account numbers in the program tracking data, within a given program year. There was no activity in RMIP in PY16.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-9 presents the participation counts, reported energy and demand savings, and incentive payments for RMIP in PY16 by customer segment.

Table 3-9: RMIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY16 # Participants	0	0
PYRTD MWh/yr	-	-
PYRTD MW/yr	-	-
PY16 Incentives ($1,000)	$0	$0

Source: Guidehouse analysis

3.2.2 Gross Impact Evaluation

Due to limited program activity, Guidehouse did not conduct a gross impact evaluation for RMIP in PY16. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.3 Net Impact Evaluation

Guidehouse did not conduct net impact evaluation research for RMIP in PY16 due to low program participation thus far in Phase IV. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.3.1 HIM Research

Guidehouse did not conduct HIM research for the RMIP in PY16.

3.2.4 Verified Savings Estimates

In Table 3-10, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RMIP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-10: RMIP PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	-	-
PYVTD Gross	-	-
PYVTD Net	-	-
RTD	7	0.00
VTD Gross	7	0.00
VTD Net	7	0.00

Source: Guidehouse analysis

3.2.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RMIP in PY16 due to low program participation thus far in Phase IV. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.6 Program Finances and Cost-Effectiveness Reporting

Table 3-11 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-11 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-11: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$17	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$1	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$16	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$1
8	Administration and Management	$ -	$ -	$41	$1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$61
11	EDC Evaluation Costs	$ -		$2	
12	SWE Audit Costs	$ -		$2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ -		$108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ -		$125	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$3	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$3	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$6	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.05	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-12 presents program financials and cost-effectiveness on a net savings basis. Since this program was not included in Phase III and NTG research has not been conducted yet for this program in Phase IV, the NTGR is assumed to be 1.0.

Table 3-12: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$17	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$1	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$16	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$1
8	Administration and Management	$ -	$ -	$41	$1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$61
11	EDC Evaluation Costs	$ -		$2	
12	SWE Audit Costs	$ -		$2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ -		$108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ -		$125	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$3	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$3	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$ -	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.05	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.2.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.3 Residential Upstream Incentives

RUIP offers point-of-sale incentives for qualified energy efficient lighting and appliances[11] to Duquesne Light's residential customers, which are paid directly to manufacturers. Customers purchase discounted products at participating retailers without having to complete rebate applications. This program eliminates the burden of customers filling out rebate applications, leading to reduced program participation barriers for customers. RUIP fosters a partnership among the CSP, manufacturers, and retailers through the CSP's delivery team that supports retailers and manufacturers throughout the product promotion and rebate processing journey. The CSP for this program is CLEAResult. There was no activity in RUIP in PY16.

3.3.1 Participation and Reported Savings by Customer Segment

Table 3-13 presents the participation counts, reported energy and demand savings, and incentive payments for RUIP in PY16 by customer segment.

Table 3-13: RUIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY16 # Participants	N/A	N/A
PYRTD MWh/yr	-	-
PYRTD MW/yr	-	-
PY16 Incentives ($1,000)	$0	$0

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Due to no program activity, Guidehouse did not conduct a gross impact evaluation for RUIP in PY16.

3.3.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for RUIP in PY16. Table 2-4 shows the NTGR applied to RUIP projects that was carried over from the PY14 NTG evaluation.

3.3.3.1 HIM Research

Guidehouse did not conduct HIM research for RUIP in PY16.

3.3.4 Verified Savings Estimates

In Table 3-14, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for

[11] Non-lighting upstream measures may include heat pump water heaters, ENERGY STAR dehumidifiers, advanced power strips, and ENERGY STAR room air conditioners.

RUIP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-14: RUIP PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	-	-
PYVTD Gross	-	-
PYVTD Net	-	-
RTD	6,756	0.97
VTD Gross	7,456	1.40
VTD Net	5,108	1.02

Source: Guidehouse analysis

3.3.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RUIP in PY16.

3.3.6 Program Finances and Cost-Effectiveness Reporting

Table 3-15 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-15 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-15: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$1,868	
2	Rebates to Participants and Trade Allies	$ -		$178	
3	Upstream/Midstream Incentives	$ -		$483	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$1,207	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$7	$5
8	Administration and Management	$ -	$25	$92	$130
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$17	$ -	$14	$1,518
11	EDC Evaluation Costs	$21		$72	
12	SWE Audit Costs	$10		$45	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$73		$1,884	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$73		$3,752	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$2,350	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$1,094	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$(280)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$3,164	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.84	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-16 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-16: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$1,262	
2	Rebates to Participants and Trade Allies	$ -		$116	
3	Upstream/Midstream Incentives	$ -		$319	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$567	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$7	$5
8	Administration and Management	$ -	$25	$92	$130
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$17	$ -	$14	$1,518
11	EDC Evaluation Costs	$21		$72	
12	SWE Audit Costs	$10		$45	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$73		$1,884	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$73		$3,146	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$1,574	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$740	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ (185)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$2,129	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.68	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.3.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.4 Residential Appliance Recycling

RARP helps customers become more energy efficient by educating them about the amount of energy consumed by and the costs associated with operating inefficient refrigerators, freezers, dehumidifiers, and room air conditioners. It then provides access to a no-cost service that removes and recycles the operational but inefficient appliance. Customer motivation is enhanced by providing a cash incentive for program participation. For RARP, participation is equal to the number of distinct measures in the program tracking data within a given program year.

3.4.1 Participation and Reported Savings by Customer Segment

Table 3-17 presents the participation counts, reported energy and demand savings, and incentive payments for RARP in PY16 by customer segment.

Table 3-17: RARP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY16 # Participants	2,097	2,097
PYRTD MWh/yr	1,408	1,408
PYRTD MW/yr	0.37	0.37
PY16 Incentives ($1,000)	$101	$101

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a gross impact evaluation for RARP in PY16 and applied the historic realization rates from PY15 for the different stratum. Table 3-18 shows the reported energy savings in PY16, and Table 3-19 shows the reported demand savings in PY16.

Table 3-18: RARP Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Freezers	141	91%	0.75	22%
Other	232	105%	0.15	5%
Refrigerators	1,034	102%	0.49	10%
Program Total	**1,408**	**101%**	**0.37**	**7%**

Source: Guidehouse analysis

Table 3-19: RARP Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Freezers	0.02	91%	0.75	22%
Other	0.17	116%	0.56	20%
Refrigerators	0.18	102%	0.49	10%
Program Total	**0.37**	**107%**	**0.35**	**11%**

Source: Guidehouse analysis

3.4.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for RARP in PY16. Table 2-4 shows the NTGR applied to RARP projects that was carried over from the PY15 NTG evaluation.

3.4.3.1 HIM Research

Guidehouse did not conduct HIM research for RARP in PY16.

3.4.4 Verified Savings Estimates

In Table 3-20, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings for RARP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-20: RARP PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,408	0.37
PYVTD Gross	1,422	0.40
PYVTD Net	1,019	0.29

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
RTD	5,031	1.20
VTD Gross	5,343	1.29
VTD Net	3,167	0.77

Source: *Guidehouse analysis*

3.4.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RARP in PY16.

3.4.6 Program Finances and Cost-Effectiveness Reporting

Table 3-21 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-21 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-21: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$108		$319	
2	Rebates to Participants and Trade Allies	$101		$310	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$7		$9	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$5	$3
8	Administration and Management	$20	$30	$109	$101
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$35	$48	$29	$1,394
11	EDC Evaluation Costs	$14		$51	
12	SWE Audit Costs	$7		$32	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$154		$1,723	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$262		$2,042	
15	Total NPV Lifetime Electric Energy Benefits	$210		$684	
16	Total NPV Lifetime Electric Capacity Benefits	$143		$422	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$353		$1,105	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.35		0.54	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-22 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY15 Net Impact Evaluation.

Table 3-22: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$78		$190	
2	Rebates to Participants and Trade Allies	$72		$176	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$5		$13	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$-	$5	$3
8	Administration and Management	$20	$30	$109	$101
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$35	$48	$29	$1,394
11	EDC Evaluation Costs	$14		$51	
12	SWE Audit Costs	$7		$32	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$154		$1,723	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$232		$1,913	
15	Total NPV Lifetime Electric Energy Benefits	$151		$402	
16	Total NPV Lifetime Electric Capacity Benefits	$102		$249	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$253		$651	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.09		0.34	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.4.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.5 Residential Low-Income Energy Efficiency

The Residential LIEEP is a direct-install program that includes walkthrough and comprehensive audits, provides energy efficiency education, and installs energy efficient products and equipment at no cost to the participant. Additionally, the program mailed out energy efficient kits to prospective participants and distributed a number of giveaway measures at local events. The program provides these services to residential households at or below 150% of the federal poverty income guidelines who reside in single-family or multifamily housing.

Under LIEEP, income-qualified residential customers will be scheduled for a virtual assessment or in-home energy audit that will include direct-install measures and energy education. For the virtual assessment, the direct-install measures will be drop-shipped to the customer in the form of a customized energy efficiency kit and customers may be referred for installation of eligible HVAC, water heat, health and safety, and insulation or air sealing measures. Participation in this program is equal to the number of distinct account numbers in the tracking data within a given program year.

Multifamily facilities are eligible for cost-share common area lighting and management-owned appliance recycling or replacement measures. The upgrade cost-share and savings are based on the percentage of LI occupants dwelling in the multifamily facility.

3.5.1 Participation and Reported Savings by Customer Segment

Table 3-23 presents the participation counts, reported energy and demand savings, and incentive payments for LIEEP in PY16 by customer segment.

Table 3-23: LIEEP and Reported Impacts

Parameter	Residential LI	Total
PY16 # Participants	8,804	8,804
PYRTD MWh/yr	2,431	2,431
PYRTD MW/yr	0.19	0.19
PY16 Incentives ($1,000)	$0	$0

Source: Guidehouse analysis

3.5.2 Gross Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse conducted a gross impact evaluation for LIEEP in PY16. Guidehouse conducted a participant survey analysis for the direct-install component of the program, while performing an engineering desk review of the giveaway component. The sample for the direct-install participant survey did not result in any responses for appliance measures installed through the audit. Therefore, Guidehouse applied a historic realization rate from the PY14 analysis to that stratum. Table 3-24 shows the reported energy savings in PY16, and Table 3-25 shows the reported demand savings in PY16.

Table 3-24: LIEEP Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audit – Aerators	237	95%	0.16	8%
Audit – Appliances	453	100%	-	0%
Audit – LEDs	389	95%	0.19	4%
Audit – Night Lights	399	92%	0.25	5%
Audit – Smart Strips	760	101%	0.19	4%
Giveaways	31	100%	-	0%
Appliance Recycling	163	124%	0.26	35%
Program Total	**2,431**	**99%**	**0.08**	**2%**

Source: Guidehouse analysis

Table 3-25: LIEEP Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audit – Aerators	0.03	94%	0.19	9%
Audit – Appliances	0.01	100%	-	0%
Audit – LEDs	0.04	96%	0.16	4%
Audit – Night Lights	-	-	-	0%
Audit – Smart Strips	0.08	99%	0.24	5%
Giveaways	0.00	100%	-	0%
Appliance Recycling	0.03	124%	0.26	34%
Program Total	**0.19**	**101%**	**0.12**	**5%**

Source: Guidehouse analysis

The LIEEP analysis resulted in differences between reported and verified savings. The following factors lead to those discrepancies:

- Customers who recycled refrigerators through LIEEP reported using their refrigerators 100% of the year as opposed to the default assumption of 72% used in the reported savings calculations. One customer reported the recycled refrigerator was used as a secondary appliance while reported savings assume they are recycling a primary refrigerator.

- For APS, reported savings for three sampled customers were based on a Tier 2 APS despite the tracking data indicating it was a Tier 1 measure. Other differences in reported and verified savings for APS were due to differences in the APS functional use (i.e., office, homes entertainment center) compared with what is assumed within the

tracking data. The survey did not ask the number of APS used for each use, so in the cases where customers reported both home office and entertainment center use, the analysis leveraged the average savings of the two.

- Duquesne Light used the default savings values for showerheads installed in multifamily locations with electric heating. However, the tracking data (PMRS) reported that these measures were installed in single-family homes.

3.5.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for Residential LIEEP in PY16. Guidehouse does not plan to conduct an NTG assessment during Phase IV for the LIEEP. Per SWE's Phase IV Evaluation Framework Section 3.4 guidance, Guidehouse will assume and assign an NTGR of 1.0 for LI programs because free ridership and spillover are not anticipated among LI participants due to income constraints.

3.5.3.1 HIM Research

Guidehouse did not conduct HIM research for LIEEP in PY16.

3.5.4 Verified Savings Estimates

In Table 3-26, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LIEEP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-26: LIEEP PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,431	0.19
PYVTD Gross	2,417	0.20
PYVTD Net	2,417	0.20
RTD	9,922	0.96
VTD Gross	9,424	0.92
VTD Net	9,424	0.92

Source: Guidehouse analysis

3.5.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LIEEP in PY16.

3.5.6 Program Finances and Cost-Effectiveness Reporting

Table 3-27 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-27 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-27: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$40	
2	Rebates to Participants and Trade Allies	$1,436		$2,433	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$1,089		$2,957	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(2,525)		$(5,350)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$32	$17
8	Administration and Management	$147	$180	$213	$586
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$70	$ -	$57	$1,486
11	EDC Evaluation Costs	$82		$289	
12	SWE Audit Costs	$42		$179	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$521		$2,859	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$521		$2,899	
15	Total NPV Lifetime Electric Energy Benefits	$618		$1,755	
16	Total NPV Lifetime Electric Capacity Benefits	$102		$417	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$(33)		$(157)	
19	Total NPV Lifetime Water Impacts	$190		$540	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$877		$2,555	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.68		0.88	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-28 presents program financials and cost-effectiveness on a net savings basis. Per the SWE's guidance, NTGR for LI programs will be a deemed value of 1.0 due to the assumption that there is no free ridership or spillover due to cost constraints.

Table 3-28: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$40	
2	Rebates to Participants and Trade Allies	$1,436		$2,433	
3	Upstream/Midstream Incentives	$ -		$ -	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$1,089		$2,957	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(2,525)		$(5,350)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$32	$17
8	Administration and Management	$147	$180	$213	$586
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$70	$ -	$57	$1,486
11	EDC Evaluation Costs	$82		$289	
12	SWE Audit Costs	$42		$179	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$521		$2,859	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$521		$2,899	
15	Total NPV Lifetime Electric Energy Benefits	$618		$1,755	
16	Total NPV Lifetime Electric Capacity Benefits	$102		$417	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$(33)		$(157)	
19	Total NPV Lifetime Water Impacts	$190		$540	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$877		$2,555	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.68		0.88	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.5.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-29 provides a summary of the direct install component findings, along with Duquesne Light's plan to address the recommendations in program delivery.

Table 3-29: LIEEP Findings and Recommendations

Findings	Recommendations
Reported Savings	

Findings	Recommendations
• Duquesne Light used the default savings values for a Tier 2 APS for three of the sampled customers (i.e., 5719550007, 5688850344, 6845570104). However, the tracking data (PMRS) reported that these measures were Tier 1. In PMRS, more than 180 LIEEP APS measures claim Tier 2 savings despite a Tier 1 measure being installed.	• Duquesne Light should ensure reported savings align with the customer data and the corresponding TRM defaults.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations.	
Reported Savings	
• Duquesne Light used the default savings values for showerheads installed in multifamily locations with electric heating. However, the tracking data (PMRS) reported that these measures were installed in single family homes.	• Duquesne Light should ensure reported savings align with the customer data and the corresponding TRM defaults.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations.	

Source: Guidehouse analysis

3.6 Residential Behavioral

The Residential Behavioral Energy Efficiency Program (R-BEEP) influences behavior changes in customers by providing information via personalized HERs to participants. The program provides these HERs to participants via mail, email, and access through the Duquesne Light web account portal. These reports provide participants information about their recent and historic energy use and compare it with electricity use of similar homes. The reports also provide participants with energy-saving tips, some of which are tailored to participants' home characteristics if they filled out the Home Energy Analysis survey with Duquesne Light. Furthermore, these reports provide information on other Duquesne Light energy efficiency programs, which helps increase awareness of those programs among Duquesne Light's customers.

Duquesne Light launched the R-BEEP in PY4 to target high use residential customers. The current program participation levels include:

- 11,063 customers from the 2012 MR wave
- 28,521 customers from the 2015 MR wave
- 6,105 customers from the 2015 LI wave
- 50,931 customers from the 2021 digital wave
- 52,548 customers from the 2021 non-digital wave
- 7,207 customers from the 2021 LI wave
- 36,362 customers from the 2023 digital wave
- 12,996 customers from the 2023 non-digital wave
- 13,551 customers from the 2023 LI wave
- 26,343 customers from the 2024 digital 1 wave
- 14,976 customers from the 2024 digital 2 wave (based on PY16 monthly averages)

The 2021, 2023, and 2024 digital and non-digital waves are all market rate (MR) waves. The 2018 LI wave did not receive reports in PY16, and therefore, is excluded from this report.

Savings for the 2015, 2021, and 2023 LI waves are reported and verified under the LI Behavioral Energy Efficiency Program (LI-BEEP). The administration, implementation, and evaluation for those LI participants is similar to their MR participant counterparts. Section 3.7 details the LI evaluation results.

A participant is defined as a customer who received HERs during the program year (i.e., PY16). The participant count represents the average number of unique participants who received HERs across each month of PY16. The program is an opt-out program in which the CSP, Oracle, enrolls participants in the program based on a randomized control trial (RCT) program design. Enrolled customers can opt out of the program by calling or emailing the program implementer. To preserve the RCT design, opt-out customers are included in the analysis.

In the RCT design, eligible customers are randomly assigned to treatment and control groups. Due to random assignment, any difference in usage between treatment customers (i.e., the program participants) and control customers is a result of participation in the program.

3.6.1 Participation and Reported Savings by Customer Segment

Table 3-30 presents the participation counts, reported energy and demand savings, and incentive payments for HERs in PY16 by customer segment for the MR waves. LI-BEEP participant results are reflected in LI-BEEP, as Section 3.7 shows.

Table 3-30: R-BEEP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY16 # Participants	233,741	233,741
PYRTD MWh/yr	6,956	6,956
PYRTD MW/yr	1.95	1.95
PY16 Incentives ($1,000)	$0	$0

Source: Guidehouse analysis

3.6.2 Gross Impact Evaluation

The main methodological issue for the impact evaluation is to estimate the counterfactual energy use by households participating in R-BEEP. In other words, the impact evaluation compares actual energy usage against the estimated energy that participating households would have used in the absence of the program. The program used an RCT experimental design, meaning that households were randomly allocated to the control and treatment groups. This eliminated the selection bias that complicates the evaluation of many behavioral programs. The random assignment of households to the treatment and control groups means the control group should serve as a robust baseline against which the energy use of the treatment households can be compared to estimate savings from enrollment in R-BEEP.

Guidehouse estimated program savings by adhering to the SWE's guidance described by the Framework.[12] The evaluation team used a monthly lagged dependent variable (LDV) model. This model uses only post-enrollment program observations and replaces the household fixed-effect with the household's energy use in the same calendar month of the pre-program year to

[12] SWE Framework, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

account for household-level variation in energy use. The model takes the form Equation 1 shows.

Equation 1: LDV Model Specification

$$\boldsymbol{kWh_{im} = \sum_{m=1}^{12} \beta_{1m} yrmo_m + \sum_{m=1}^{12} \beta_{2m} yrmo_m \cdot kWh_{im-12} + \sum_{m=1}^{12} \beta_{3m} yrmo_m \cdot treatment_{im} + \varepsilon_{im}}$$

Where:

kWh_{im}	is customer *i*'s average daily energy usage in bill *m*.
β_{1m}	is the coefficient on the bill year-month *m*.
$yrmo_m$	is the indicator variable equal to 1 for each year-month in the analysis.
β_{2m}	is the coefficient on the home-specific pre-program usage term, which is interacted with bill month.
kWh_{im-12}	is customer *i*'s average daily energy usage from the 12-month period prior to the program launch.
β_{3m}	is the estimated treatment effect in kilowatt-hours per day per customer. This is the main parameter of interest. Estimated separately for each month and year.
$treatment_{im}$	is the treatment indicator variable. Equal to 1 when the treatment is in effect for the treatment group and 0 otherwise.
ε_{im}	is the error term, clustered by customer.

The LDV model is the preferred model used for reporting savings. As a check on the robustness of the savings estimates, Guidehouse also ran a linear fixed-effects regression (LFER) model. Due to the experimental design of the program, the two models should generate similar results. In the LFER model, average daily consumption by participant and nonparticipant *i* in billing period *m* is denoted by kWh_{im}. This is referred to as a fixed-effects model because it includes a household-specific fixed-effects term. Equation 2 presents the equation for this model.

Equation 2: Fixed-Effects Regression Model

$$kWh_{im} = \beta_i + \sum_{m=1}^{12} \beta_{1m} yrmo_m + \sum_{m=1}^{12} \beta_{2m} yrmo_m \cdot treatment_{im} + \varepsilon_{im}$$

Where:

β_i	is the household-specific fixed-effect that implicitly captures all customer-specific effects on electricity use that do not change over time. The calculation of the fixed-effect term does not require knowledge of which characteristics at each household are unchanged.
β_{1m}	is the coefficient on the bill year-month *m.*
β_{2m}	is the estimated treatment effect in kilowatt-hours per day. This is the main parameter of interest. Estimated separately for each month and year.

All other variables are defined above.

An advantage of the LFER model is that the time-invariant characteristics (observed and unobserved) are excluded from the model through the household fixed-effect term. The model's

drawback is that it is less precise because the household-level fixed-effect term relies exclusively on within-customer variation. The explanatory powers of time-invariant characteristics are lost because those terms are eliminated from the model. Guidehouse found the LFER model generally corroborated the savings found from the LDV model, though some differences in the magnitude of savings existed for smaller waves[13].

The evaluation team deployed specific data management methodologies to prepare billing data for the regressions. These methodologies are informed by Section 6.1.4 of the Phase IV Evaluation Framework and feedback Guidehouse received from the SWE during evaluations in Phase III. Before calendarization, Guidehouse removed accounts with an inactive date prior to the PY16 evaluation period. A small number of accounts had multiple inactive dates. Guidehouse corrected for this by taking the maximum of inactive dates per account, consistent with the approach used in Phase III. Monthly billing data were calendarized by expanding the billing periods (which follow variable meter read schedules) to daily data and then collapsing them into a common calendar basis. Each month of usage data represents an aggregation of the usage data from the bills that contain data for that month. Estimated reads, which are infrequent for Duquesne Light, were handled by summing the consecutive estimated reads with the first actual read that followed and dividing that aggregated use across the number of days since the previous actual read. Participants and nonparticipants who moved out of Duquesne Light territory during PY16 were included in the regression analysis until move-out occurred and monthly billing data ceased. There is a monotonically decreasing number of participants per month for each cohort.

Guidehouse calculated participant counts following a standard approach where the last available month of billing data is calculated for each account and the household is assumed to be active for all months prior. This participant counting approach is used to obtain an average participant count across all months of the program year. A customer is considered a participant through their latest bill in PY16 so long as their account was still active.

Table 3-31 summarizes the sampling strategy for the PY16 evaluation. Both regression models use billing data from all treatment and control households enrolled in R-BEEP. The sampling strategy is a census approach where data from all households are used in the analysis.

Table 3-31: R-BEEP Gross Impact Sample Design for PY15

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
R-BEEP	233,741	233,741	Regression analysis
Program Total	**233,741**	**233,741**	

Source: Guidehouse analysis

The verified ex post energy savings for R-BEEP in PY16 were 6,891 MWh, after accounting for double-counted savings with other Duquesne Light energy efficiency programs and persistence from prior years. Guidehouse calculated the peak demand savings by dividing the total energy savings for the year (in megawatt-hours) by 8,760 hours, then multiplying by the peak demand multiplier. After applying the line loss factor (LLF), this yields 1.38 MW of peak demand savings.

[13] The LDV and LFER treatment coefficient estimates differ by approximately 60% for the 2018 LI wave, on average. None of these estimates are statistically different from zero.

Table 3-32 and Table 3-33 summarize ex ante R-BEEP energy and demand savings, respectively. Appendix B provides additional details.

Table 3-32: R-BEEP Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
R-BEEP	6,956	99%	-	0.0%
Program Total	6,956	**99%**	**-**	**0.0%**

Source: Guidehouse analysis

Table 3-33: R-BEEP Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
R-BEEP	1.95	71%	-	0.0%
Program Total	**1.95**	**71%**	**-**	**0.0%**

Source: Guidehouse analysis

Energy savings per participant home were verified similar to the CSP's reported estimate. Demand savings were verified slightly lower than the CSP's reported estimate. The following factors led to variation between the reported and verified savings and to the observed realization rates:

- The CSP did not complete a detailed double-counted savings analysis. Instead, they made assumptions based on Phase III evaluations. Double-counted savings made up 15% of measured savings from the regression analysis.
- The CSP peak demand savings methodology considers only the summer months and applies a slightly different peak demand multiplier than the Guidehouse approach. Energy savings in summer months often differ considerably from average savings for the year, particularly for new waves. This contributes to differences in the reported and verified demand savings estimates.
- The CSP uses a different model specification than the preferred model described in the Framework.[14]. For waves with statistically insignificant savings in some months, different model specifications may deliver very different point estimates, despite the confidence bounds of both estimates overlapping. Half of the MR waves had statistically insignificant savings in at least one month in PY16.

Based on SWE guidance, Guidehouse counts verified savings regardless of statistical significance. Confidence intervals are large relative to the magnitude of verified savings, which can result in high or low realization rates despite no statistically significant difference between the CSP's reported estimate and Guidehouse's verified estimate.

Behavioral Program and Component Absolute Precision

[14] SWE Framework, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Guidehouse calculated the absolute precision results for the R-BEEP waves. Section 6.1.1.1 of the Phase IV Evaluation Framework requires the program-level verification for these behavioral programs to achieve an absolute precision of ±0.5% at the 95% confidence level (two-tailed), while individual waves may have a wider margin of error. Appendix B provides regression details, precisions, and error estimates.

Table 3-32 and Table 3-33 do not reflect the standard errors from the regression analysis. Instead, those tables reflect the uncertainty associated with the sampling (i.e., relative precision at the 85% confidence level). Guidehouse analyzed all R-BEEP data via a census approach and did not use sampling. There is no sampling uncertainty.

3.6.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for R-BEEP in PY16. Guidehouse does not plan to conduct an NTG assessment during Phase IV for this program.

Free ridership and participant spillover are incorporated in the results of the regression analysis due to the RCT design of R-BEEP. Section 2.2.2 of the SEE Action protocol states the following:

> *RCTs eliminate this free-rider concern during the study period because the treatment and control groups each contain the same number of free riders through the process of random assignment to the treatment or control groups. When the two groups are compared, the energy savings from the free riders in the control group cancel out the energy savings from the free riders in the treatment group, and the resulting estimate of program energy savings is an unbiased estimate of the savings caused by the program (the true program savings).*
>
> *[Participant spillover], in which participants engage in additional energy efficiency actions outside of the program as a result of the program, is also automatically captured by an RCT design for energy use that is measured within a household.*

However, the RCT design does not account for nonparticipant spillover. Section 2.2.2 of the SEE Action protocol continues as follows:

> *[Nonparticipant spillover] issues in which a program influences the energy use of non-program participants are not addressed by RCTs. In these cases in which nonparticipant spillover exists, an evaluation that relies on RCT design could underestimate the total program-influenced savings.*

Free ridership and spillover are incorporated into the results of the R-BEEP regression analysis based on customer billing records. Nonparticipant spillover is not included in the regression analysis, but the industry standard approach is to assume that nonparticipant spillover is small for this type of program. It would be primarily driven by conversations participants may have with nonparticipant Duquesne Light customers, which are expected to have a relatively small impact on nonparticipant energy savings. The conservative approach used by Guidehouse assumes that nonparticipant spillover is 0% and the NTGR for R-BEEP is 100%. As a result, the net and gross savings estimates are the same for R-BEEP. There is no NTG sample for R-BEEP.

The team did not consider a sample for the net impact analysis, and net impacts equal the gross impacts. The NTGR is assumed to be 100%.

3.6.3.1 HIM Research

Guidehouse did not conduct HIM research for R-BEEP in PY16.

3.6.4 Verified Savings Estimates

In Table 3-34, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for R-BEEP in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-34: R-BEEP PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	6,956	1.95
PYVTD Gross	6,891	1.38
PYVTD Net	6,891	1.38
RTD	28,148	5.48
VTD Gross	27,635	4.72
VTD Net	27,635	4.72

Source: Guidehouse analysis

3.6.5 Process Evaluation

Guidehouse did not conduct process evaluation research for R-BEEP (i.e., HERs) in PY16.

3.6.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-35. TRC benefits in Table 3-35 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-35: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$6	$5
8	Administration and Management	$20	$42	$165	$132
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$87	$778	$71	$2,076
11	EDC Evaluation Costs	$18		$64	
12	SWE Audit Costs	$10		$41	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$955		$2,560	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$955		$2,560	
15	Total NPV Lifetime Electric Energy Benefits	$438		$1,457	
16	Total NPV Lifetime Electric Capacity Benefits	$245		$749	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$683		$2,206	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.72		0.86	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-36 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-36: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$-		$-	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$-		$-	
		EDC	CSP	EDC	CSP
7	Program Design	$-	$-	$6	$5
8	Administration and Management	$20	$42	$165	$132
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$87	$778	$71	$2,076
11	EDC Evaluation Costs	$18		$64	
12	SWE Audit Costs	$10		$41	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$955		$2,560	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$955		$2,560	
15	Total NPV Lifetime Electric Energy Benefits	$438		$1,457	
16	Total NPV Lifetime Electric Capacity Benefits	$245		$749	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$683		$2,206	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.72		0.86	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.6.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-37 summarizes the findings with a response from Duquesne Light and their plans to address the recommendation in program delivery.

Table 3-37: Residential Behavioral Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Persistence for MR home energy report (HER) waves represents 56% of net savings in PY16. Roughly 25% of first year energy savings come from the 2023 Non-Digital wave, which is not yet subject to accounting for persistence. Per participant first year savings from the 2024 waves are low, particularly for the Digital 2 wave. Savings for new waves are expected to increase throughout the remainder of the Phase given that PY16 was their first year of exposure.	• Guidehouse recommends that Oracle continue to monitor the performance of the new 2024 waves and adjust planning to account for an extended ramp up period if low savings estimates persist.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will continue to monitor performance.	

Source: Guidehouse analysis

3.7 Low-Income Behavioral

The Low-Income Behavioral (LI-BEEP) program targets qualified LI customers, whose household is at or below 150% of federal poverty income guidelines. For LI-BEEP, verified savings attributable to the LI sector are reflected in Duquesne Light's progress toward the Phase IV LI carveout goal.

In the same manner as the MR R-BEEP, LI-BEEP influences behavior changes in customers by providing information via HERs to participants. The administration, implementation, and evaluation for LI participants is similar to their MR participant counterparts. Section 0 details the MR evaluation results.

LI-BEEP participation is defined as a customer under the LI rate class and receiving HERs during the program year. The participant count represents the average number of unique participants who received HERs across each month of PY16. Current program participation levels include 6,105 customers from the 2015 LI wave, 7,207 customers from the 2021 LI wave, and 13,551 customers from the 2023 LI wave (based on PY16 monthly averages).

3.7.1 Participation and Reported Savings by Customer Segment

Table 3-38 presents the participation counts, reported energy and demand savings, and incentive payments for LI-BEEP in PY16 by customer segment.

Table 3-38: LI-BEEP Participation and Reported Impacts

Parameter	Residential LI	Total
PY16 # Participants	26,863	26,863
PYRTD MWh/yr	549	549
PYRTD MW/yr	0.07	0.07
PY16 Incentives ($1,000)	$0	$0

Source: Guidehouse Analysis

3.7.2 Gross Impact Evaluation

Guidehouse completed LI-BEEP activities in coordination with the R-BEEP MR program and applied the same methodologies Section 3.6 details.

The verified ex post energy savings for LI-BEEP in PY16 were 696 MWh, after accounting for double-counted savings with other Duquesne Light energy efficiency programs and persistence from prior years. Guidehouse calculated the peak demand savings by dividing the total energy savings for the year (in megawatt-hours) by 8,760 hours, then multiplying by the peak demand multiplier. After applying the LLF, this yields 0.14 MW of peak demand savings. Table 3-39 and Table 3-40 summarize ex ante LI behavioral energy efficiency and demand savings, respectively. Appendix B provides additional details.

Table 3-39: LI-BEEP Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LI-BEEP	549	127%	-	0.0%
Program Total	**549**	**127%**	**-**	**0.0%**

Source: Guidehouse analysis

Table 3-40: LI-BEEP Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LI HER	0.07	193%	-	0.0%
Program Total	**0.07**	**193%**	**-**	**0.0%**

Source: Guidehouse analysis

Energy and demand savings per participant home were verified higher than the CSP's reported estimates. The following factors led to variation between the reported and verified savings and to the observed realization rates:

- The CSP did not complete a detailed double-counted savings analysis. Instead, they made assumptions based on Phase III evaluations. Double-counted savings made up 20% of measured savings from the regression analysis.
- The CSP peak demand savings methodology considers only the summer months and applies a slightly different peak demand multiplier than the Guidehouse approach. Energy savings in summer months often differ considerably from average savings for the year, particularly for new waves. This contributes to differences in the reported and verified demand savings estimates.
- The CSP uses a different model specification than the preferred model described in the Framework.[15]. For waves with statistically insignificant savings in some months, different model specifications may deliver very different point estimates, despite the confidence bounds of both estimates overlapping. All LI waves had statistically insignificant savings in at least one month in PY16.

Based on SWE guidance, Guidehouse counts verified savings regardless of statistical significance. Confidence intervals are large relative to the magnitude of verified savings, contributing to a high realization rate despite no statistical difference between the CSP and Guidehouse estimates.

Behavioral Program and Component Absolute Precision

Guidehouse calculated the absolute precision results for the LI behavioral energy efficiency waves. Section 6.1.1.1.1 of the Phase IV Evaluation Framework requires the program-level verification for these behavioral programs to achieve an absolute precision of ±0.5% at the 95% confidence level (two-tailed), while individual waves may have a wider margin of error. Appendix B provides regression details, precisions, and error estimates.

Table 3-39 and Table 3-40 do not reflect errors. Instead, those tables reflect the uncertainty associated with the sampling (i.e., relative precision at the 85% confidence level). Guidehouse analyzed all LI-BEEP data via its census approach and did not use sampling. There is no sampling uncertainty to report.

3.7.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for LI-BEEP in PY16. Guidehouse does not plan to conduct NTG assessment during Phase IV for this program. Consistent with SWE's guidance, Guidehouse assumes NTGRs to be 100% for this program due to the nature of the RCT approach (see Section 0).

3.7.3.1 HIM Research

Guidehouse did not conduct HIM research for LI-BEEP in PY16.

3.7.4 Verified Savings Estimates

In Table 3-41 the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LI

[15] SWE Framework, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

behavioral energy efficiency in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-41: PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	549	0.07
PYVTD Gross	696	0.14
PYVTD Net	696	0.14
RTD	2,539	0.26
VTD Gross	2,853	0.41
VTD Net	2,853	0.41

Source: Guidehouse analysis

3.7.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LI-BEEP (i.e., HERs) in PY16.

3.7.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-42. TRC benefits in Table 3-42 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-42: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$1	$1
8	Administration and Management	$20	$5	$164	$24
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$29	$164	$24	$619
11	EDC Evaluation Costs	$4		$14	
12	SWE Audit Costs	$2		$9	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$224		$856	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$224		$856	
15	Total NPV Lifetime Electric Energy Benefits	$44		$145	
16	Total NPV Lifetime Electric Capacity Benefits	$25		$68	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$69		$213	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.31		0.25	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-43 presents program financials and cost-effectiveness on a net savings basis. Per the SWE's guidance, NTGR for LI programs will be a deemed value of 1.0 due to the assumption that there is no free ridership or spillover due to cost constraints.

Table 3-43: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$1	$1
8	Administration and Management	$20	$5	$164	$24
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$29	$164	$24	$619
11	EDC Evaluation Costs	$4		$14	
12	SWE Audit Costs	$2		$9	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$224		$856	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$224		$856	
15	Total NPV Lifetime Electric Energy Benefits	$44		$145	
16	Total NPV Lifetime Electric Capacity Benefits	$25		$68	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$69		$213	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.31		0.25	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.7.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-44 presents a summary of the findings with a response from Duquesne Light and their plans to address the recommendation in program delivery.

Table 3-44: LI Behavioral Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Persistence for LI HER waves represents 34% of net savings in PY16. Nearly 70% of all first year energy savings come from the 2023 LI wave, which did not accrue any persistence in PY16 because it is in its second year of exposure to HER messaging. Prior to accounting for persistence, per participant savings are higher for the older waves, with the exception of the 2018 LI wave, which did not receive treatment in PY16. Peak demand impacts follow a similar pattern, with nearly all demand savings contributed by the 2023 LI wave.	• Guidehouse recommends that Duquesne Light continue monitoring the performance of LI HER waves in PY17 and consider retirement for the 2018 LI wave.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will continue to monitor performance.	

Source: Guidehouse analysis

3.8 Small Business Direct Install

The SBDI program targets Duquesne Light C&I customers and municipalities with monthly demand less than 300 kW. The SBDI program is designed to address sector-specific barriers to small and medium C&I customers and municipalities. Barriers to program participation included limited capital resources, high cost of capital (interest rates), lack of expertise, communication barriers, and conflicting priorities. Customers in these segments are often subject to split incentives, where electric bill-paying customers are tenants but not the owners of the properties at which they conduct their businesses. Owners do not pay the electric bills, so they are not motivated to upgrade energy-using equipment to save on electric bills; electric bill-paying tenants are not motivated to upgrade properties they do not own. Participating customers will receive a no-cost energy assessment and incentives that cover up to 80% of the resulting equipment and installation costs.[16] A limited quantity of energy savings products may be provided at the time of assessment at no cost.

During Phase IV, this program emphasizes very small businesses (micro-businesses), such as small local bakeries or hardware stores. This program works with cities and towns through community and economic development offices, and with local chambers of commerce and business associations to encourage customers to take part in the SBDI program. Third-party contractors then survey a customer's site, obtain written approval from the customer, and install energy efficiency equipment at their site. Used equipment is properly disposed of according to all relevant state, local, and federal regulations. Duquesne Light conducts random inspections of

[16] Measures include lighting, VFDs, and a variety of refrigeration measures. A full list of measures is available at https://www.duqenergyefficiency.com/sbdi.

completed sites. This program is projected to account for approximately 6% of nonresidential program savings during Phase IV.

In addition to the SBDI program, Guidehouse is reporting the common area portion of the Small Multifamily Housing Retrofit Program (SMHR) under SBDI. This program consists of cost-share measures, including lighting, ventilation, and whole-building measures, installed in the common area portions of small multifamily buildings. In PY16, 42% of these savings were reported as part of the LI carveout.

3.8.1 Participation and Reported Savings by Customer Segment

Table 3-45 presents the participation counts, reported energy and demand savings, and incentive payments for SBDI in PY16 by customer segment.

Table 3-45: SBDI Participation and Reported Impacts

Parameter	LI	Small C&I*	GNI	Total
PY16 # Participants	1	9	0	10
PYRTD MWh/yr	196	277	-	473
PYRTD MW/yr	0.03	0.04	-	0.06
PY16 Incentives ($1,000)	$39	$42	$0	$81

Source: Guidehouse analysis

3.8.2 Gross Impact Evaluation

Within the SBDI program, Guidehouse evaluates both the Multifamily Housing Retrofit Program as well as any other projects aligning under the SBDI initiative. Per the Guidehouse Evaluation Plan, for Phase IV, Guidehouse did not conduct an impact evaluation for any SBDI programs in PY16. Table 3-46 presents the gross impact results for energy, and Table 3-47 provides the gross impact results for demand, as carried over from the PY15 evaluation.

Table 3-46: SBDI Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Multifamily	473	99%	0.07	22%
Program Total	**473**	**99%**		**22%**

Source: Guidehouse analysis

Table 3-47: SBDI Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Multifamily	0.06	166%	0.31	90%
Program Total	**0.06**	**166%**		**90%**

Source: Guidehouse analysis

Most SBDI projects sampled in PY15 (n=18) had realization rates very close to (or exceeding) 100% for both energy and demand, indicating that the implementer is accurately reporting savings for this program.

However, realization rates for a number of sites exceeded the expected variance (+/- 10%), all involving lighting or lighting control improvement projects. Guidehouse verified three projects (one in Small Multifamily and two SBDI sites) with energy realization rates ranging between 82% and 88%, due to discrepancies in verified hours of use (HOU) or lighting control types pre- and post-retrofit.

Guidehouse also calculated energy realization rates exceeding 110% for three lighting improvement projects; primary drivers of realization rate included differences in HOU, coincidence factor, verified lighting control types, or installed fixture counts.

3.8.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBDI in PY16. Table 2-4 shows the NTGR applied to SBDI projects, which was carried over from the PY14 NTG evaluation.

3.8.3.1 HIM Research

Guidehouse did not conduct HIM research for SBDI in PY16.

3.8.4 Verified Savings Estimates

In Table 3-48, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBDI in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-48: SBDI PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	473	0.06
PYVTD Gross	469	0.11
PYVTD Net	436	0.10
RTD	11,212	1.89
VTD Gross	10,428	1.98

VTD Net	9,789	1.85

Source: Guidehouse analysis[17]

3.8.5 Process Evaluation

Guidehouse did not conduct process evaluation research for the SBDI program in PY16.

3.8.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-49. TRC benefits in Table 3-49 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

[17] In the PY15 Annual Report, Guidehouse inadvertently removed the PY14 low-income multifamily savings, 295 MWh and 0.03 MW, from the phase to date savings. Guidehouse has fixed the error in the PY16 report.

Table 3-49: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$127		$2,812	
2	Rebates to Participants and Trade Allies	$-		$1,492	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$3,577	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$127		$(2,257)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$17	$15
8	Administration and Management	$1	$64	$68	$336
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$-	$11	$561
11	EDC Evaluation Costs	$54		$186	
12	SWE Audit Costs	$26		$114	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$159		$1,309	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$286		$4,121	
15	Total NPV Lifetime Electric Energy Benefits	$219		$4,243	
16	Total NPV Lifetime Electric Capacity Benefits	$119		$1,958	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$11		$603	
18	Total NPV Lifetime Fossil Fuel Impacts	$(34)		$(469)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$314		$6,335	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.10		1.54	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-50 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-50: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$118		$2,628	
2	Rebates to Participants and Trade Allies	$-		$1,405	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$3,322	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$110		$(1,952)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$17	$15
8	Administration and Management	$1	$64	$68	$336
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$-	$11	$561
11	EDC Evaluation Costs	$54		$186	
12	SWE Audit Costs	$26		$114	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$159		$1,309	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$277		$3,937	
15	Total NPV Lifetime Electric Energy Benefits	$203		$3,976	
16	Total NPV Lifetime Electric Capacity Benefits	$111		$1,833	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$10		$564	
18	Total NPV Lifetime Fossil Fuel Impacts	$(32)		$(438)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$292		$5,935	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.05		1.51	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.8.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.9 Small Business Solutions

The SBS program offers rebates to offset the higher cost of high efficiency equipment compared to standard efficiency equipment. Program incentives promote customer indifference to the higher cost of high efficiency equipment and increase customer adoption of high efficiency equipment. The program's primary objective is to provide C&I customers an expedited, quantifiable, and simple-to-understand incentive offering that helps them save energy and money.

The SBS program targets C&I customers having annual demand less than 300 kW, and customer engagement channels to assist customers to overcome unique, segment specific barriers to energy efficiency program participation. The program offers two core participation tracks: prescriptive and custom. The prescriptive track offers a simplified method on predefined measures without requiring complex analysis and will generally include deemed and partially deemed measures[18] from the TRM. The custom track makes it possible to include more complex, site-specific measures and projects in the programs. Custom projects must be able to show specific and verifiable energy savings and costs using TRM protocols.

3.9.1 Participation and Reported Savings by Customer Segment

Table 3-51 presents the participation counts, reported energy and demand savings, and incentive payments for SBS in PY16 by customer segment.

Table 3-51: SBS Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY16 # Participants	131	26	157
PYRTD MWh/yr	5,606	330	5,936
PYRTD MW/yr	1.08	0.08	1.15
PY16 Incentives ($1,000)	$494	$47	$541

Source: Guidehouse analysis

3.9.2 Gross Impact Evaluation

The Business Solutions programs (SBS/LBS) are projected to account for approximately 57% of all Duquesne Light's Phase IV savings (residential and nonresidential). To date, the SBS and LBS programs have achieved a slightly lower percentage of the portfolio savings than anticipated, due in large part to the overperformance of the midstream programs.

As with other nonresidential programs, Guidehouse is evaluating the SBS program on a specified schedule. As detailed in the evaluation plan, Guidehouse combined both the PY15 and PY16 SBS populations when determining the PY16 evaluation sample and included the realization rates of the sites sampled in PY15 in determining the rolling 2-year realization rate. Because of the size of this initiative, Guidehouse is targeting an 85/15 confidence/precision

[18] A list of measures considered prescriptive is available at https://www.duqenergyefficiency.com/business-solutions.

level for the small and large programs individually over a 2-year period. Table 3-52 presents the gross impact results for energy, and Table 3-53 presents the gross impact results for demand.

Table 3-52: SBS Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Large	840	92%	-	0%
Medium	2,543	100%	0.08	5%
Small	2,553	88%	0.47	27%
Program Total	**5,936**	**94%**	**0.19**	**10%**

Source: Guidehouse analysis

Table 3-53: SBS Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Large	0.11	76%	-	0%
Medium	0.50	90%	0.15	10%
Small	0.54	93%	0.53	30%
Program Total	**1.15**	**90%**	**0.26**	**14%**

Source: Guidehouse analysis

Guidehouse sampled ten SBS sites for PY16 and all but four had realization rates close to 100%; three sites had realization rates below 90% while one had an energy realization rate above 110%.

One such site had an overall energy realization rate of 27% and demand realization rate of 28%. Guidehouse verified a pre-retrofit wattage compared to what was originally assumed in App C (7670W compared to 3900W); this was the primary driver of realization rate and confirmed by the site contact.

The second site had an overall energy realization rate of 72% and demand realization rate of 72%. Guidehouse found discrepancies in the pre and post-retrofit control types, ultimately reducing consumption. In specific, the provided App C indicated that a pre-existing light switch control was reported, but all other documentation, as well as HOU and building type, indicated that the fixtures were photocell controlled. This adjustment was the primary driver for a lower than 100% realization rate.

The final site with realization rates below 90% had an overall energy realization rate of 87% and demand realization rate of 100%. The only major discrepancy for this project came from the

HOU; Guidehouse utilized an updated HOU as verified by the site contact. While HOU changed, the total number of peak hours remained consistent, only impacting total energy savings.

3.9.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBS in PY16. Table 2-4 shows the NTGR applied to SBS projects, which was carried over from the PY14 NTG evaluation.

3.9.3.1 HIM Research

Guidehouse did not conduct HIM research for SBS in PY16.

3.9.4 Verified Savings Estimates

In Table 3-54, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBS in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-54: SBS PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	5,936	1.15
PYVTD Gross	5,558	1.04
PYVTD Net	3,668	0.68
RTD	28,167	6.05
VTD Gross	29,645	7.11
VTD Net	20,564	4.99

Source: Guidehouse analysis[19]

3.9.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SBS in PY16.

3.9.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-55. TRC benefits in Table 3-55 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-55: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$1,358		$4,438	
2	Rebates to Participants and Trade Allies	$540		$1,755	

[19] In the PY15 Annual Report, Guidehouse inadvertently removed the PY15 SBS LED savings, 26 MWh and 0.01 MW, from the VTD Net savings. Guidehouse has fixed the error in the PY16 report.

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$818		$2,683	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$14	$15
8	Administration and Management	$100	$240	$176	$582
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$88	$229	$72	$1,748
11	EDC Evaluation Costs	$86		$248	
12	SWE Audit Costs	$44		$159	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$787		$3,014	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$2,145		$7,452	
15	Total NPV Lifetime Electric Energy Benefits	$2,636		$12,217	
16	Total NPV Lifetime Electric Capacity Benefits	$1,139		$7,082	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$283		$1,173	
18	Total NPV Lifetime Fossil Fuel Impacts	$(367)		$(1,555)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$3,691		$18,917	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.72		2.54	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-56 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-56: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$896		$3,047	
2	Rebates to Participants and Trade Allies	$356		$1,214	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$356		$1,260	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$14	$15
8	Administration and Management	$100	$240	$176	$582
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$88	$229	$72	$1,748
11	EDC Evaluation Costs	$86		$248	
12	SWE Audit Costs	$44		$159	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$787		$3,014	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$1,683		$6,061	
15	Total NPV Lifetime Electric Energy Benefits	$1,740		$8,523	
16	Total NPV Lifetime Electric Capacity Benefits	$752		$5,012	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$187		$815	
18	Total NPV Lifetime Fossil Fuel Impacts	$(242)		$(1,074)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$2,436		$13,276	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.45		2.19	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.9.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-57 provides a summary of findings, along with Duquesne Light's plans to address program recommendations.

Table 3-57: SBS Findings and Recommendations

Findings	Recommendations
Reported Savings	
• 4 of 10 projects had differing schedules compared to expected values; this led to a slight variation in energy realization rates for this program, 87% and 168% respectively, and an increase in energy savings overall. Both projects HOU were altered based on the site-contact description and did not vary dramatically from what was expected. A change in HOU and schedule did, however, also impact the CF of 3 other projects, equating to a demand realization rate of 148%, 50%, and 149%.	• Duquesne Light should consider requiring additional documentation to verify HOU for Small Business Solutions. This may include logger data replicating areas designated within the App C or post-installation BAS data representing a typical week.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	

Source: Guidehouse analysis

3.10 Small Business Midstream Solutions

The Nonresidential Midstream Lighting program delivers incentives to end-use customers via C&I product distributors or manufacturers. End-use customers, property/facility managers, and installation contractors acting on behalf of C&I end-use customers purchase qualified products from a participating distributor. The program shows the impact of a midstream delivery method of energy efficient lighting using a buy-down pricing strategy. The participating distributors discount targeted product wholesale prices at the POS and in turn receive an incentive payment. The program design removes barriers to participation by providing a streamlined, simple solution for C&I customers and their contractors to receive the incented price for qualifying products with no additional effort on their part. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, from the perspective of the customer and distributor, there is only one program.

End-use customers installing the discounted equipment were identified by the participating distributors (based on self-reports from the buyers) to enable evaluation at the customer level. However, some of the end-use customers are not cognizant of their participation in a program and the normal level of cooperation with the evaluation's verification may be challenging. Further, customers may or may not keep track of where they have installed specific equipment that was obtained from the individual purchase selected for verification by the evaluation team. In Phase III, this has led to more difficulty in contacting and verifying midstream customers. Guidehouse addresses this issue by oversampling this program to ensure that statistical targets are met and working directly with the CSP and Duquesne Light to identify points of contact for this program.

3.10.1 Participation and Reported Savings by Customer Segment

Table 3-58 presents the participation counts, reported energy and demand savings, and incentive payments for SBMS in PY16 by customer segment. As shown below, there was no participation for SBMS in PY16.

Table 3-58: SBMS Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY16 # Participants	0	0	0
PYRTD MWh/yr	-	-	-
PYRTD MW/yr	-	-	-
PY16 Incentives ($1,000)	$0	$0	$0

Source: Guidehouse analysis

3.10.2 Gross Impact Evaluation

Given there was no participation in PY16, SBMS was not evaluated for gross impact.

3.10.3 Net Impact Evaluation

Given there was no participation in PY16, SBMS was not evaluated for net impact.

3.10.3.1 HIM Research

Guidehouse did not conduct HIM research for SBMS or LBMS in PY16.

3.10.4 Verified Savings Estimates

Due to program design, distributors serve customers of all sizes regardless of which program customers participate.

3.10.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SMBS or LBMS in PY16.

3.10.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-59. TRC benefits in Table 3-59 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-59: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$13,654	
2	Rebates to Participants and Trade Allies	$-		$1,502	
3	Upstream/Midstream Incentives	$-		$6,246	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$-		$5,907	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$12	$9
8	Administration and Management	$-	$-	$44	$75
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$-	$176	$-	$3,855
11	EDC Evaluation Costs	$-		$53	
12	SWE Audit Costs	$-		$31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$176		$4,079	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$176		$17,734	
15	Total NPV Lifetime Electric Energy Benefits	$-		$24,317	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$13,055	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$2,878	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$(3,720)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$-		$36,530	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		2.06	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-60 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-60: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$9,363	
2	Rebates to Participants and Trade Allies	$-		$1,081	
3	Upstream/Midstream Incentives	$-		$4,240	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$-		$2,781	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$12	$9
8	Administration and Management	$-	$-	$44	$75
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$-	$176	$-	$3,855
11	EDC Evaluation Costs	$-		$53	
12	SWE Audit Costs	$-		$31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$176		$4,079	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$176		$13,443	
15	Total NPV Lifetime Electric Energy Benefits	$-		$16,674	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$8,968	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$1,979	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$(2,547)	
19	Total NPV Lifetime Water Impacts	$-		$-	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$-		$25,074	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		1.87	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.10.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.11 Small Business Virtual Commissioning

The VCx programs use a turnkey approach that targets system-based no- to low-cost operational savings for commercial customers and public facilities. These 100% pay-for-performance programs do not fit a traditional model that uses trade allies, mass marketing, or standardized prescriptive retrofits; rather, they provide a targeted, data-driven approach to energy efficiency engagement that effectively eliminates the need for enrollment forms, incentives, or administrative costs. This program is filed as two programs in Duquesne Light's Phase IV plan—one as a small C&I program and one as a large C&I program. However, f the customer and implementer there is only one program.

The SBVCx program targets customers having annual maximum demand less than 300kW. The CSP for this program is Franklin Energy, which subcontracts to a VCx specialist, Power TakeOff. The program used advanced metering infrastructure (AMI) data analytics to identify and qualify customers with significant potential for energy savings. The identification process uses data modeling techniques to selectively pinpoint individual meters with significant potential for operational energy savings. Customers are then contacted by the CSP to help them understand their energy usage and provide them with personalized recommendations for low- to no-cost energy savings opportunities. Facilities that are confirmed to have implemented changes based on their recommendations are continuously monitored after participation to ensure savings persistence, and if a pre-determined level of savings drift is detected, the customer is re-engaged.

3.11.1 Participation and Reported Savings by Customer Segment

Table 3-61 presents the participation counts, reported energy and demand savings, and incentive payments for SBVCx in PY16 by customer segment.

Table 3-61: SBVCx Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY16 # Participants	3	0	3
PYRTD MWh/yr	101	-	101
PYRTD MW/yr	0.00	-	0.00
PY16 Incentives ($1,000)	$18	$0	$18

Source: Guidehouse analysis

3.11.2 Gross Impact Evaluation

Consistent with the updated evaluation plan, as approved by the SWE, Guidehouse applied the results from the PY15 evaluation to the PY16 program savings to determine verified savings values for PY16. SBVCx reported savings for 3 projects in PY16. Table 3-62 and Table 3-63 show the realized verified energy and demand savings, respectively, for the program.

Table 3-62: SBVCx Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx – Small	101	99%	0.01	0%
Program Total	101	**99%**	**0.01**	**0%**

Source: Guidehouse analysis

Table 3-63: SBVCx Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx – Small	0.00	90%	0.06	1%
Program Total	**0.00**	**90%**	**0.06**	**1%**

Source: Guidehouse analysis

In PY15, 39 projects were evaluated. Most projects showed realization rates near 100% for energy, and no sites showed realization rates <80% or >120% for energy. This led to a low (72%) realization rate for that site. However, Guidehouse found that two of the sites had significant demand savings that was not claimed, leading to the high realization rate for demand. One site with zero claimed demand savings had significantly increased demand, lowering realization rate for the program.

While Guidehouse targets evaluating a census of VCx projects, one project from the program did not have a project file associated with it. Rather than remove this project from the savings, Guidehouse applied the realization rate for the evaluated projects to that site.

3.11.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBVCx or LBVCx in PY16. Table 2-4 shows the NTGR applied to SBVCx and LBVCx projects, which was carried over from the PY15 NTG evaluation.

3.11.3.1 HIM Research

Guidehouse did not conduct HIM research for SBVCx or LBVCx in PY16.

3.11.4 Verified Savings Estimates

In Table 3-64, the realization rates determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBVCx in PY16.

Table 3-64: SBVCx PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	101	0.00
PYVTD Gross	100	0.00
PYVTD Net	94	0.00
RTD	2,860	0.49
VTD Gross	2,804	0.54
VTD Net	2,658	0.51

Source: Guidehouse analysis

3.11.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SBVCx or LBVCx in PY16.

3.11.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-65. TRC benefits in PY16 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-65: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$8		$279	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(8)		$(279)	
		EDC	CSP	EDC	CSP
7	Program Design	$-	$-	$1	$4
8	Administration and Management	$-	$10	$67	$55
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$11	$11	$102
11	EDC Evaluation Costs	$8		$30	
12	SWE Audit Costs	$4		$15	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$47		$286	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$47		$286	
15	Total NPV Lifetime Electric Energy Benefits	$26		$1,117	
16	Total NPV Lifetime Electric Capacity Benefits	$1		$521	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$27		$1,638	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.57		5.72	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-66 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY16 comes from the PY15 Net Impact Evaluation.

Table 3-66: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$8		$267	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(7)		$(256)	
		EDC	CSP	EDC	CSP
7	Program Design	$-	$-	$1	$4
8	Administration and Management	$-	$10	$67	$55

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$11	$11	$102
11	EDC Evaluation Costs	$8		$30	
12	SWE Audit Costs	$4		$15	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$47		$286	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$47		$286	
15	Total NPV Lifetime Electric Energy Benefits	$25		$1,059	
16	Total NPV Lifetime Electric Capacity Benefits	$1		$496	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$25		$1,554	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.54		5.43	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.11.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

3.12 Large Business Solutions

The LBS program offers rebates to offset the higher cost of high efficiency equipment compared to standard efficiency equipment. Program incentives promote customer indifference to the higher cost of high efficiency equipment and increase customer adoption of high efficiency equipment. The programs' primary objective is to provide C&I customers an expedited, quantifiable, and simple-to-understand incentive offering that helps them save energy and money. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, from the perspective of the customer, there is only one program.

The LBS program targets C&I customers having annual demand savings greater than or equal to 300 kW. The LBS program will employ targeted customer engagement channels to assist customers to overcome unique, segment specific barriers to energy efficiency program participation. The program offers two core participation tracks: prescriptive and custom. The prescriptive track offers a simplified method on predefined measures without requiring complex analysis and will generally include deemed and partially deemed measures[20]from the TRM. The custom track makes it possible to include more complex, site-specific measures and projects in

[20] A list of measures considered prescriptive is available at https://www.duqenergyefficiency.com/business-solutions.

the programs. Custom projects must be able to show specific and verifiable energy savings and costs using TRM protocols.

3.12.1 Participation and Reported Savings by Customer Segment

Table 3-67 and Table 3-68 present the participation counts, reported energy and demand savings, and incentive payments for LBS Commercial and LBS Industrial, respectively, in PY16 by customer segment.

Table 3-67: LBS Participation and Reported Impacts (Commercial)

Parameter	Large C&I*	GNI	Total
PY16 # Participants	20	22	42
PYRTD MWh/yr	12,182	9,957	22,139
PYRTD MW/yr	2.61	1.83	4.44
PY16 Incentives ($1,000)	$895	$833	$1,728

*LBS has a Multifamily component associated with it, which a percentage of savings can be claimed under Residential LI. In PY16, this component reported 0 MWh/yr of LI savings.

Source: Guidehouse analysis

Table 3-68: LBS Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY16 # Participants	7	0	7
PYRTD MWh/yr	2,469	-	2,469
PYRTD MW/yr	0.30	-	0.30
PY16 Incentives ($1,000)	$145	$0	$145

Source: Guidehouse analysis

3.12.2 Gross Impact Evaluation

In alignment with the SBS program, the LBS program is also evaluated on a rolling-basis, combining multiple years to determine program realization rates. Per the Phase IV evaluation plan, Guidehouse combined both the PY15 and PY16 LBS populations when determining the PY16 evaluation sample. To calculate realization rates, the realization rates of the sites sampled in PY15 and PY16 were then used to determine the rolling 2-year realization rate.

Because of the size of this initiative, the evaluation team is targeting an 85/15 confidence/precision level for the small and large programs individually over the 2-year periods. Table 3-69 presents the gross impact results for energy, and Table 3-70 presents the gross impact results for demand.

Table 3-69: LBS Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Commercial - Certainty	3,319	94%	-	0%
Commercial - Large	12,634	97%	0.08	6%
Commercial - Medium	5,641	95%	0.10	5%
Commercial - Small	545	98%	0.07	5%
Industrial - Large	1,877	107%	0.14	18%
Industrial - Medium	407	95%	0.10	5%
Industrial - Small	184	98%	0.07	5%
Program Total*	**24,608**	**97%**	**0.05**	**3%**

** Values may not add up to Program Total due to rounding*
Source: Guidehouse analysis

Table 3-70: LBS Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Commercial - Certainty	0.88	99%	-	0%
Commercial - Large	2.37	109%	0.22	16%
Commercial - Medium	1.05	104%	0.12	6%
Commercial - Small	0.14	100%	0.18	13%
Industrial - Large	0.19	90%	0.15	20%
Industrial - Medium	0.07	104%	0.12	6%
Industrial - Small	0.04	100%	0.18	13%
Program Total*	**4.75**	**105%**	**0.12**	**7%**

** Values may not add up to Program Total due to rounding*
Source: Guidehouse analysis

Nine of the 14 projects evaluated in PY16 had realization rates within 10% of 100% for both energy and demand, indicating that the implementer is accurately reporting savings for this program. Five sites fell outside of the acceptable realization rate range, with three reporting an energy realization rate of below 100% and the other two reporting energy realization rates over 110%.

The three sites with realization rates below the acceptable range had RRs driven by differing schedules compared to reported values. This led to a slight variation in energy realization rates for this program and an overall decrease in energy savings. A change in HOU and schedule also impacted the coincidence factor of a single project, increasing its demand realization rate to 125%.

Of the two sites reporting greater than 110% realization rate, the first was driven by differences in verified HOU while the second was driven by updated metered data. These resulted in an energy realization rate of 112% and 115%, respectively.

3.12.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse conducted free ridership and spillover research for LBS in PY16. Guidehouse estimated NTG actors for LBS based on results from an online participant survey. In total, five participants completed the battery of NTG questions. Table 3-71 shows the estimated free ridership, spillover, and NTGR resulting from the PY16 survey of LBS participants.

Table 3-71: PY15 SBVCx and LBVCx Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
LBS	10%	0%	90%	1.73	15%

Source: Guidehouse analysis

3.12.3.1 HIM Research

Guidehouse did not conduct HIM research for LBS in PY16.

3.12.4 Verified Savings Estimates

In Table 3-72 and Table 3-73, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LBS Commercial and LBS Industrial, respectively, in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-72: LBS (Commercial) PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	22,139	4.44
PYVTD Gross	21,206	4.71
PYVTD Net	19,054	4.23
RTD	50,495	10.30
VTD Gross	50,643	10.52
VTD Net	35,446	7.51

Source: Guidehouse analysis[21]

Table 3-73: LBS (Industrial) PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,469	0.30
PYVTD Gross	2,585	0.29
PYVTD Net	2,322	0.26
RTD	29,338	3.10
VTD Gross	29,755	3.13
VTD Net	14,349	1.54

Source: Guidehouse analysis

3.12.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LBS in PY16.

3.12.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-74 and Table 3-75 for LBS Commercial and LBS Industrial, respectively. TRC benefits in Table 3-74 and Table 3-75 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-74: Summary of Program Finances – Gross Verified (LBS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$6,207		$10,537	
2	Rebates to Participants and Trade Allies	$2,098		$3,736	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$4,109		$6,801	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$45	$18
8	Administration and Management	$100	$261	$153	$783
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$58	$1,569	$47	$3,566
11	EDC Evaluation Costs	$107		$372	
12	SWE Audit Costs	$55		$234	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$2,150		$5,218	

[21] In the PY15 Annual Report, Guidehouse inadvertently removed the PY15 low-income multifamily savings from the PYVTD Net savings, 95 MWh and 0.01 MW. Guidehouse has fixed the error in the PY16 report.

14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$8,357		$15,755	
15	Total NPV Lifetime Electric Energy Benefits	$9,888		$20,343	
16	Total NPV Lifetime Electric Capacity Benefits	$5,156		$10,122	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$807		$1,568	
18	Total NPV Lifetime Fossil Fuel Impacts	$(1,085)		$(2,191)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$14,766		$29,842	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.77		1.89	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-75: Summary of Program Finances – Gross Verified (LBS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$266		$4,132	
2	Rebates to Participants and Trade Allies	$148		$1,654	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$118		$2,478	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$15	$14
8	Administration and Management	$99	$114	$152	$345
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$58	$51	$47	$1,976
11	EDC Evaluation Costs	$47		$166	
12	SWE Audit Costs	$24		$105	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$393		$2,820	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$659		$6,953	
15	Total NPV Lifetime Electric Energy Benefits	$1,222		$11,447	
16	Total NPV Lifetime Electric Capacity Benefits	$321		$2,945	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$22		$146	
18	Total NPV Lifetime Fossil Fuel Impacts	$(79)		$(816)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$1,487		$13,721	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.26		1.97	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-76 and Table 3-77 present program financials and cost-effectiveness on a net savings basis for LBS Commercial and LBS Industrial, respectively. The NTGR applied in PY16 comes from the PY14 Net Impact Evaluation.

Table 3-76: Summary of Program Finances – Net Verified (LBS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$5,577		$7,377	
2	Rebates to Participants and Trade Allies	$1,885		$2,642	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$3,318		$3,637	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$45	$18
8	Administration and Management	$100	$261	$153	$783
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$58	$1,569	$47	$3,566
11	EDC Evaluation Costs	$107		$372	
12	SWE Audit Costs	$55		$234	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$2,150		$5,218	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$7,727		$12,595	
15	Total NPV Lifetime Electric Energy Benefits	$8,885		$14,202	
16	Total NPV Lifetime Electric Capacity Benefits	$4,633		$7,172	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$725		$1,111	
18	Total NPV Lifetime Fossil Fuel Impacts	$(975)		$(1,540)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$13,268		$20,946	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.72		1.66	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-77: Summary of Program Finances – Net Verified (LBS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$239		$1,903	
2	Rebates to Participants and Trade Allies	$133		$783	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$95		$528	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$15	$14
8	Administration and Management	$99	$114	$152	$345
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$58	$51	$47	$1,976
11	EDC Evaluation Costs	$47		$166	
12	SWE Audit Costs	$24		$105	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$393		$2,820	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$632		$4,723	
15	Total NPV Lifetime Electric Energy Benefits	$1,098		$5,548	
16	Total NPV Lifetime Electric Capacity Benefits	$289		$1,453	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$20		$77	
18	Total NPV Lifetime Fossil Fuel Impacts	$(71)		$(408)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$1,336		$6,670	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.11		1.41	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.12.7 Status of Recommendations

The impact and process evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-78 provides a summary of findings, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-78: LBS Findings and Recommendations

Findings	Recommendations
Reported Savings	
• 3 of 14 projects had differing schedules compared to expected values; this led to a slight variation in energy realization rates for this program, 57% and 112% for 2 projects, and a decrease in energy savings. Both projects HOU were altered based on the site-contact description and did not vary dramatically from what was expected. A change in HOU and schedule did, however, also impact the CF of a single project, increasing its demand realization rate to 125%.	• Duquesne Light should consider requiring additional documentation to verify HOU for Large Business Solutions. This may include logger data replicating areas designated within the App C or post-installation BAS data representing a typical week.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Reported Savings	
• The 8760 outputs from PVWatts do not make adjustments for daylight savings time. Due to this the hours identified for summer peak demand should shift back one hour and average the savings across hours 13-16 EST to model system performance in the 2pm to 6pm EDT period. This shifts the hours averaged for summer peak demand closer to solar noon and increases the expected demand savings for PV projects.	• Duquesne Light should ensure that all future solar analysis using PVWatts incorporates an adjustment to the daylight savings time.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations.	
Project Submission	
• Two projects had completion and rebate submissions with lengths well beyond the 180 days as specified by the Final IO from Phase IV.	• Duquesne Light should proactively flag any projects that may be >180 days between application and reported into the DLC tracking data (PMRS) to ensure Guidehouse and the SWE have a proper understanding and these instances can be managed proactively where needed.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations.	

Source: Guidehouse analysis

3.13 Large Business Midstream Solutions

The LBMS program delivers incentives to end-use customers via C&I product distributors or manufacturers. End-use customers, property/facility managers, and installation contractors acting on behalf of C&I end-use customers to purchase qualified products from a participating distributor. The participating distributors discount targeted product wholesale prices at the POS and in turn receive an incentive payment. The program design removes barriers to participation by providing a streamlined, simple solution for C&I customers and their contractors to receive

the incented price for qualifying products with no additional effort on their part. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, from the perspective of the customer and distributor, there is only one program.

End-use customers installing the discounted equipment are identified by the participating distributors (based on self-reports from the buyers) to enable evaluation at the customer level. However, some of the end-use customers may not be cognizant of their participation in a program and the normal level of cooperation with the evaluation's verification may be challenging. Further, customers may or may not keep track of where they have installed specific equipment that was obtained from the individual purchase selected for verification by the evaluation team. In the past, this has led to more difficulty in contacting and verifying midstream customers. Guidehouse has addressed this issue by oversampling this program to ensure that statistical targets are met and working directly with the CSP and Duquesne Light to identify points of contact for this program.

3.13.1 Participation and Reported Savings by Customer Segment

Table 3-79 and Table 3-80 present the participation counts, reported energy and demand savings, and incentive payments for LBMS Commercial and LBMS Industrial, respectively, in PY15 by customer segment.

Table 3-79: LBMS Participation and Reported Impacts (Commercial)

Parameter	Large C&I	GNI	Total
PY16 # Participants	70	70	140
PYRTD MWh/yr	4,338	4,458	8,797
PYRTD MW/yr	0.86	0.89	1.75
PY16 Incentives ($1,000)	$313	$428	$741

*Large C&I are the total savings associated with their respective sectors, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex ante savings (PYRTD).

Source: Guidehouse analysis

Table 3-80: LBMS Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY16 # Participants	28	0	28
PYRTD MWh/yr	1,426	-	1,426
PYRTD MW/yr	0.38	-	0.38
PY16 Incentives ($1,000)	$104	$0	$104

*Large C&I are the total savings associated with their respective sectors, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex ante savings (PYRTD).

Source: Guidehouse analysis

3.13.2 Gross Impact Evaluation

Consistent with the updated evaluation plan, as approved by the SWE, Guidehouse conducted a complete evaluation of LBMS in PY16. Guidehouse assigned each project to various strata based on that project's energy savings. The large stratum includes projects in the upper portion of the Midstream program component's energy savings; the medium stratum includes projects in the middle portion of the Midstream energy savings; and the small stratum represents the bottom portion of the Midstream energy savings.

Table 3-81 presents the gross impact results for energy, and Table 3-82 presents the gross impact results for demand. Although C&I LBMS savings are reported separately, they were evaluated as one initiative, with realization rates calculated at the stratum level (Large, Medium, and Small) but not separated between C&I.

Table 3-81: LBMS Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LBMS – Large (Commercial)	4,960	155%	0.16	12%
LBMS – Medium (Commercial)	2,751	159%	0.78	39%
LBMS – Small (Commercial)	1,085	310%	0.53	42%
LBMS – Large (Industrial)	746	72%	0.38	50%
LBMS – Medium (Industrial)	539	159%	0.78	39%
LBMS – Small (Industrial)	140	135%	-	0%
Program Total*	10,222	166%	0.24	13%

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.

Source: Guidehouse analysis

Table 3-82: LBMS Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LBMS – Large (Commercial)	1.03	203%	0.11	9%
LBMS – Medium (Commercial)	0.50	147%	0.81	40%
LBMS – Small (Commercial)	0.22	271%	0.26	21%
LBMS – Large (Industrial)	0.18	86%	0.26	34%
LBMS – Medium (Industrial)	0.16	147%	0.81	40%
LBMS – Small (Industrial)	0.03	111%	-	0%
Program Total*	2.13	181%	0.18	9%

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.

Source: Guidehouse analysis

The following factors are examples of the evaluated details from the projects evaluated in PY16 that led to variation between the reported and verified savings and led to the observed realization rates. This variation is expected in a midstream program where minimal ex ante data is required from the customer and CSP.

- Nine of 30 LBMS projects had discrepancies in either Post-Retrofit Lighting Control Type, Pre-Retrofit Fixture Wattage, Post-Retrofit Fixture Quantities, or Pre-Retrofit Fixture Wattage. This led to increased variation in realization rates across the program.
- Twenty one of 30 LBMS projects had differing HOU compared to reported values; this led to significant variation in realization rate (mostly positive) across the program.
- While most sites had discrepancies due to conservative HOU values from the TRM, one site was found to have lower verified HOU, leading to an energy and demand realization rate of 45% and 119% respectively.

3.13.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBMS or LBMS in PY16. Table 2-4 shows the NTGR applied to SBMS and LBMS projects, which was carried over from the PY15 NTG evaluation.

3.13.3.1 HIM Research

Guidehouse did not conduct HIM research for SBMS or LBMS in PY16.

3.13.4 Verified Savings Estimates

Due to program design, distributors serve customers of all sizes regardless of which program customers participate. Therefore, Guidehouse applied realization rates and NTGRs to the energy and demand savings for both Large and Small Midstream Solutions to calculate verified savings estimates. Table 3-83 presents the verified savings estimates for LBMS in PY16. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-83: LBMS PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	10,222	2.13
PYVTD Gross	17,014	3.86
PYVTD Net	14,972	3.39
RTD	39,211	8.33
VTD Gross	52,075	10.29
VTD Net	39,914	8.00

**Savings include both SBMS and LBMS, as they are evaluated as a single initiative.*

Source: Guidehouse analysis

3.13.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SMBS or LBMS in PY16.

3.13.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-84 and Table 3-85 for LBMS Commercial and LBMS Industrial, respectively. TRC benefits in Table 3-84 and Table 3-85 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-84: Summary of Program Finances – Gross Verified (LBMS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$1,406		$3,932	
2	Rebates to Participants and Trade Allies	$879		$1,159	
3	Upstream/Midstream Incentives	$-		$1,208	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$527		$1,565	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$7	$12
8	Administration and Management	$1	$39	$69	$204
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$626	$11	$1,589
11	EDC Evaluation Costs	$33		$114	
12	SWE Audit Costs	$16		$69	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$729		$2,075	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$2,135		$6,007	
15	Total NPV Lifetime Electric Energy Benefits	$7,292		$12,666	
16	Total NPV Lifetime Electric Capacity Benefits	$3,821		$6,039	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$710		$1,618	
18	Total NPV Lifetime Fossil Fuel Impacts	$(860)		$(1,550)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$10,963		$18,773	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	5.14		3.13	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-85: Summary of Program Finances – Gross Verified (LBMS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$197		$2,433	
2	Rebates to Participants and Trade Allies	$83		$438	
3	Upstream/Midstream Incentives	$-		$1,410	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$114		$585	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$3	$5
8	Administration and Management	$-	$16	$67	$83
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$76	$11	$1,142
11	EDC Evaluation Costs	$14		$47	
12	SWE Audit Costs	$6		$28	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$126		$1,387	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$323		$3,820	
15	Total NPV Lifetime Electric Energy Benefits	$775		$8,811	
16	Total NPV Lifetime Electric Capacity Benefits	$484		$4,061	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$63		$409	
18	Total NPV Lifetime Fossil Fuel Impacts	$(133)		$(1,517)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$1,189		$11,764	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	3.68		3.08	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-86 and Table 3-87 present program financials and cost-effectiveness on a net savings basis for LBMS Commercial and LBMS Industrial, respectively. The NTGR applied in PY16 comes from the PY15 Net Impact Evaluation.

Table 3-86: Summary of Program Finances – Net Verified (LBMS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$1,237		$3,070	
2	Rebates to Participants and Trade Allies	$774		$949	
3	Upstream/Midstream Incentives	$-		$888	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$408		$986	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$7	$12
8	Administration and Management	$1	$39	$69	$204
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$626	$11	$1,589
11	EDC Evaluation Costs	$33		$114	
12	SWE Audit Costs	$16		$69	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$729		$2,075	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$1,966		$5,145	
15	Total NPV Lifetime Electric Energy Benefits	$6,417		$10,184	
16	Total NPV Lifetime Electric Capacity Benefits	$3,363		$4,905	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$625		$1,295	
18	Total NPV Lifetime Fossil Fuel Impacts	$(757)		$(1,238)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$9,648		$15,146	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	4.91		2.94	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-87: Summary of Program Finances – Net Verified (LBMS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$173		$1,709	
2	Rebates to Participants and Trade Allies	$73		$326	
3	Upstream/Midstream Incentives	$-		$955	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$88		$319	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$3	$5
8	Administration and Management	$-	$16	$67	$83
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$76	$11	$1,142
11	EDC Evaluation Costs	$14		$47	
12	SWE Audit Costs	$6		$28	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$126		$1,387	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$299		$3,096	
15	Total NPV Lifetime Electric Energy Benefits	$682		$6,192	
16	Total NPV Lifetime Electric Capacity Benefits	$426		$2,888	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$55		$294	
18	Total NPV Lifetime Fossil Fuel Impacts	$(117)		$(1,065)	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$1,046		$8,310	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	3.49		2.68	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.13.7 Status of Recommendations

The impact evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-88 summarizes the findings and recommendations for the program, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-88: LBMS Program Findings and Recommendations

Findings	Recommendations
Reported Savings	
• 21 of 30 Large Business Midstream (LBMS) projects had differing HOU compared to expected values; this led to both an increase and decrease in Hours of Use (HOU), Coincidence Factor (CF), and total realization rates across the program. While most sites had discrepancies due to conservative TRM values for the equivalent building type, one site was reported as an incorrect site with higher expected HOU, leading to an energy and demand realization rate of 45% and 119% respectively.	• No Recommendation. The implementor is taking a conservative approach by following the IMP, mapping the appropriate building type to HOU and CF equivalents.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Reported Savings	
• 9 of 30 LBMS projects had discrepancies in either Post-Retrofit Lighting Control Type, Pre-Retrofit Fixture Wattage, Post-Retrofit Fixture Quantities, or Pre-Retrofit Fixture Wattage. This led to increased variation in realization rates across the program.	• The CSP should carefully verify pre- and post-retrofit control types, fixture wattage, and quantities through additional documentation.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and take it under advisement.	
Reported Savings	
• 148 Midstream Projects included ineligible measures. In total, this equated to 168 kWh of energy savings. Of the 148 projects, 5 were subsequently removed from the Guidehouse Sample and analysis.	• The CSP should remove all ineligible measures from their applications, and DLC should incorporate a flag into their tracking database (PMRS), so they can remove any ineligible projects moving forward.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations.	

Source: Guidehouse analysis

3.14 Large Business Virtual Commissioning

The VCx programs use a turnkey approach that targets system-based no- to low-cost operational savings for commercial customers and public facilities. These 100% pay-for-performance programs do not fit a traditional model that uses trade allies, mass marketing, or standardized prescriptive retrofits; rather, they provide a targeted, data-driven approach to energy efficiency engagement that effectively eliminates the need for enrollment forms, incentives, or administrative costs. This program is filed as two programs in Duquesne Light's Phase IV plan—one as a small C&I program and one as a large C&I program. However, from the perspective of the customer and implementer, there will be only one program.

The LBVCx program targets customers having annual maximum demand equal to or greater than 300 kW. As with the SBVCx program, the CSP is Franklin Energy, which subcontracts to a VCx specialist, Power TakeOff. The programs use AMI data analytics to identify and qualify customers with significant potential for energy savings. The identification process uses data modeling techniques to selectively pinpoint individual meters with significant potential for operational energy savings. Customers are then contacted by the CSP to help them understand their energy usage and provide them with personalized recommendations for low- to no-cost energy savings opportunities. Facilities that are confirmed to have implemented changes based on their recommendations are continuously monitored after participation to ensure savings persistence, and if a pre-determined level of savings drift is detected, the customer is re-engaged.

3.14.1 Participation and Reported Savings by Customer Segment

Table 3-89 presents the participation counts, reported energy and demand savings, and incentive payments for LBVCx in PY16 by customer segment. The LBVCx program

Table 3-89: LBVCx Participation and Reported Impacts

Parameter	Large C&I	GNI	Total
PY16 # Participants	0	1	1
PYRTD MWh/yr	-	244	244
PYRTD MW/yr	-	-	-
PY16 Incentives ($1,000)	$0	$43	$43

Source: Guidehouse analysis

3.14.2 Gross Impact Evaluation

Consistent with the updated evaluation plan, as approved by the SWE, Guidehouse applied the results from the PY15 evaluation to the PY16 program savings to determine verified savings values for PY16. LBVCx reported savings for one project in PY16. Table 3-90 and Table 3-91 show the resulting verified energy and demand savings, respectively, for the program.

Table 3-90: LBVCx Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx - Large	244	97%	-	0%
Program Total	**244**	**97%**	**-**	**0%**

Source: Guidehouse analysis

Table 3-91: LBVCx Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx - Large	-	-	-	0%
Program Total	-	-	-	0%

Source: Guidehouse analysis

3.14.3 Net Impact Evaluation

Per the PY16 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBVCx or LBVCx in PY16. Table 2-4 shows the NTGR applied to SBVCx and LBVCx projects, which was carried over from the PY15 NTG evaluation.

3.14.3.1 HIM Research

Guidehouse did not conduct HIM research for SBVCx or LBVCx in PY16.

3.14.4 Verified Savings Estimates

In Table 3-92, the realization rates determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LBVCx in PY16.

Table 3-92: LBVCx PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	244	-
PYVTD Gross	238	-
PYVTD Net	223	-
RTD	4,165	0.43
VTD Gross	4,051	0.59
VTD Net	3,950	0.58

Source: Guidehouse analysis

3.14.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SBVCx or LBVCx in PY16.

3.14.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness are presented in Table 3-93 and Table 3-94 for LBVCx Commercial and LBVCx Industrial, respectively. TRC benefits in Table 3-93 and Table 3-94 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-93: Summary of Program Finances – Gross Verified (LBVCx Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$47		$606	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(47)		$(606)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$1	$2
8	Administration and Management	$-	$5	$67	$30
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$38	$11	$161
11	EDC Evaluation Costs	$4		$15	
12	SWE Audit Costs	$2		$8	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$63		$296	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$63		$296	
15	Total NPV Lifetime Electric Energy Benefits	$62		$1,619	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$589	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$62		$2,208	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.99		7.47	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-94: Summary of Program Finances – Gross Verified (LBVCx Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$5		$4	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(5)		$(4)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$-	$1
8	Administration and Management	$-	$3	$65	$13
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$-	$11	$10
11	EDC Evaluation Costs	$2		$6	
12	SWE Audit Costs	$-		$2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$19		$109	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$19		$109	
15	Total NPV Lifetime Electric Energy Benefits	$-		$-	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$-	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$-		$-	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.00	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

Table 3-95 and Table 3-96 present program financials and cost-effectiveness on a net savings basis for LBVCx Commercial and LBVCx Industrial, respectively. The NTGR applied in PY16 comes from the PY15 Net Impact Evaluation.

Table 3-95: Summary of Program Finances – Net Verified (LBVCx Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$44		$596	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(42)		$(586)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$1	$2
8	Administration and Management	$-	$5	$67	$30
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$38	$11	$161
11	EDC Evaluation Costs	$4		$15	
12	SWE Audit Costs	$2		$8	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$63		$296	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$63		$296	
15	Total NPV Lifetime Electric Energy Benefits	$58		$1,582	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$579	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$58		$2,161	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.93		7.31	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = *2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-96: Summary of Program Finances – Net Verified (LBVCx Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$-		$-	
2	Rebates to Participants and Trade Allies	$5		$4	
3	Upstream/Midstream Incentives	$-		$-	
4	Material Cost for Self-Install Programs (EE&C Kits)	$-		$-	
5	Direct Installation Program Materials and Labor	$-		$-	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$(4)		$(4)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$-	$-	$-	$1
8	Administration and Management	$-	$3	$65	$13
9	Marketing	$-	$-	$-	$-
10	Program Delivery	$14	$-	$11	$10
11	EDC Evaluation Costs	$2		$6	
12	SWE Audit Costs	$-		$2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$19		$109	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$19		$109	
15	Total NPV Lifetime Electric Energy Benefits	$-		$-	
16	Total NPV Lifetime Electric Capacity Benefits	$-		$-	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$-		$-	
18	Total NPV Lifetime Fossil Fuel Impacts	$-		$-	
19	Total NPV Lifetime Water Impacts	$-		$-	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$-		$-	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.00	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021

Source: Guidehouse analysis

3.14.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY16.

4. Portfolio Finances and Cost Recovery

This section provides an overview of the expenditures associated with Duquesne Light's portfolio and the recovery of those costs from ratepayers.

4.1 Program Finances

Table 4-1 shows program-specific and portfolio total finances for PY16. The columns in Table 4-1 and Table 4-2 are adapted from the Direct Program Cost categories in the Commission's EE&C Plan template.[22] for Phase IV. Non-incentives include EDC materials, labor, and administration costs (including costs associated with an EDC's employees) as well as implementation conservation service provider (ICSP) materials, labor, and administration costs (including both the program implementation contractor and the costs of any other outside vendors the EDC employs to support program delivery). The dollar figures in Table 4-1 and Table 4-2 are based on EDC tracking of expenditures with no adjustments to account for inflation.[23]

Table 4-1: PY16 Program and Portfolio Total Finances

Program	Incentives	Non-Incentives	Total Cost
Res Downstream Incentives	$2,466	$911	$3,377
Res Midstream Incentives	$0	$0	$0
Residential Upstream Lighting	$0	$63	$63
Appliance Recycling	$101	$147	$248
Low-Income Energy Efficiency	$2,525	$479	$3,004
Res Behavioral EE	$0	$945	$945
Low-Income Behavioral EE	$0	$222	$222
Small Business Direct Install	$0	$133	$133
Small Business Downstream	$540	$743	$1,283
Small Business Midstream	$0	$176	$176
Small Business VCx	$8	$43	$51
Large Commercial Downstream	$2,098	$2,095	$4,193
Large Commercial Midstream	$879	$713	$1,592
Large Commercial VCx	$47	$61	$108
Large Industrial Downstream	$148	$369	$517
Large Industrial Midstream	$83	$120	$203
Large Industrial VCx	$5	$19	$24
Common Portfolio Costs[24]			**N/A**
Portfolio Total	**$8,900**	**$7,239**	**$16,139**

[22] Pennsylvania Public Utility Commission, Implementation of Act 129 of 2008—Phase IV, Energy Efficiency and Conservation Plan Template (Docket No. M-2020-3015228), https://www.puc.pa.gov/pcdocs/1676672.docx.

[23] The cost recovery of program expenses through riders generally happens promptly so that costs are being recovered from ratepayers in the same dollars that they are incurred.

[24] Common Portfolio costs could include costs associated with the tracking system, legal resources, and IT systems.

Program	Incentives	Non-Incentives	Total Cost
SWE Costs[25]	**N/A**	**N/A**	**$ 264**
Total	**$8,900**	**$7,239**	**$16,403**

Source: Guidehouse analysis

Table 4-2 shows program-specific and portfolio total finances since the inception of Phase IV.

Table 4-2: P4TD Program and Portfolio Total Finances

Program	Incentives	Non-Incentives	Total Cost
Res Downstream Incentives	$4,194	$4,054	$8,248
Res Midstream Incentives	$1	$108	$109
Residential Upstream Lighting	$698	$1,988	$2,686
Appliance Recycling	$345	$1,786	$2,131
Low-Income Energy Efficiency	$6,083	$2,893	$8,976
Residential Behavioral Energy Efficiency	$0	$2,816	$2,816
LI Behavioral Energy Efficiency	$0	$943	$943
Small Business Direct Install	$5,593	$1,308	$6,901
Small Business Downstream	$1,949	$3,170	$5,119
Small Business Midstream	$8,198	$4,296	$12,494
Small Business VCx	$312	$298	$610
Large Commercial Downstream	$4,274	$5,601	$9,875
Large Commercial Midstream	$2,637	$2,235	$4,872
Large Commercial VCx	$664	$317	$981
Large Industrial Downstream	$1,814	$2,977	$4,791
Large Industrial Midstream	$1,964	$1,457	$3,421
Large Industrial VCx	$5	$117	$122
Common Portfolio Costs[26]			**N/A**
Portfolio Total	**$38,731**	**$36,364**	**$75,096**
SWE Costs[27]	**N/A**	**N/A**	**$1,256**
Total	**$38,731**	**$36,364**	**$76,352**

Source: Guidehouse analysis

4.2 Cost Recovery

Act 129 allows Pennsylvania EDCs to recover EE&C plan costs through a cost-recovery mechanism. Duquesne Light's cost-recovery charges are organized separately by four customer sectors to ensure that the electric rate classes that finance the programs are the rate classes that receive the direct energy conservation benefits. Cost recovery is governed by tariffed rate class, so it is necessarily tied to the way customers are metered and charged for electric

[25] SWE costs are within the 2% spending cap.
[26] Common Portfolio costs could include costs associated with the tracking system, legal resources, and IT systems.
[27] Statewide Evaluation costs are within the 2% spending cap.

service. Readers should be mindful of the differences between Table 4-3 and Section 2.3. For example, the LI customer segment is a subset of Duquesne Light's residential tariff(s) and therefore not listed in Table 4-3.

Table 4-3: EE&C Plan Expenditures by Cost-Recovery Category[28] ($1,000)

Cost Recovery Sector	Rate Classes Included	PY16 Spending	P4TD Spending
Residential	RS, RH,RA	$7,946	$26,309
Small/Medium C&I	GS, GM, GMH	$1,717	$25,477
Large Commercial	GL, GLH, L	$5,963	$16,212
Large Industrial	GL, GLH, L, HVPS	$777	$8,354
Portfolio Total		**$16,403**	**$76,353**

* The portfolio total includes the SWE costs.

Source: Guidehouse analysis

For Phase IV of Act 129, Duquesne Light nominated a portion of peak demand reduction acquired via EE&C programs into the PJM FCM. Proceeds from resources that clear in the FCM flow back to the rate class that generated the savings to offset cost recovery. Table 4-4 shows the proceeds received in PY16 and P4TD net of CSP fees and other administrative costs.

Table 4-4: FCM Proceeds from Recognized Peak Demand Reductions ($1,000)

Cost Recovery Sector	Rate Classes Included	PY16 Proceeds	P4TD PJM Proceeds
Portfolio Total		**$0.270**	**$0.270**

Source: Guidehouse analysis

At the portfolio level, PY16 cost recovery requirements were lowered by a negligible amount (0.0016%) due to the FCM proceeds received from recognition of 1 MW for the 2024-2025 delivery year. P4TD cost recovery requirements have not decreased by a measurable amount due to the FCM proceeds received from recognition of 1 MW in PY16. Duquesne Light does not expect to receive any additional proceeds for the 2025/2026 delivery year. Beginning in the 2026/2027 delivery year, peak demand reduction from energy efficiency is no longer an eligible resource so Phase V cost recovery will be unaffected by proceeds from Phase IV peak demand reductions.

[28] Includes SWE costs.

Appendix A. Site Inspection Summary

Table A-1: PY16 Site Visit Summary

Program	Inspection Firm	Number of Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies and Explanation of Discrepancy
SBS	Karpinski	6	5	HOU (reported vs verified), Fixture Quantities (minor discrepancies)
LBS	Karpinski	9	9	HOU (reported vs verified), Incorrect Peak Demand Period (Solar Projects)
LBMS	Karpinski	8	8	Lighting Control Type (different than recorded), HOU (reported vs verified), Fixture Quantities (minor discrepancies)
TOTAL		**23**	**22**	

Source: Guidehouse analysis

Appendix B. Behavioral Energy Efficiency Program Impact Evaluation Detail

B.1 Data Preparation and Participant Counts

The evaluation team deployed specific data management methodologies to prepare billing data for the regressions, consistent with the steps outlined in Section 6.1.4 of the Phase IV Evaluation Framework. These methodologies are partially informed by feedback Guidehouse received from the SWE during previous evaluations. Based on an issue of multiple inactive dates for some accounts identified in PY12, Guidehouse removed accounts with a maximum inactive date prior to the start of the evaluation period. Monthly billing data were calendarized by expanding the billing periods (which follow variable meter read schedules) to daily data and then collapsing them into a common calendar basis. Each month of usage data represents an aggregation of the usage data from the bills that contain data for that month. Estimated reads, which are infrequent for Duquesne Light, were handled by summing the consecutive estimated reads with the first actual read that followed and dividing that aggregated use across the number of days since the previous actual read. Participants and nonparticipants who moved out of Duquesne Light territory during PY16 were included in the regression analysis until move-out occurred and monthly billing data ceased. There is a monotonically decreasing number of participants per month for each cohort.

Guidehouse calculated participant counts following a standard approach where the last available month of billing data is calculated for each account and the household is assumed to be active for all months prior. This participant counting approach is used to obtain an average participant count across all months of the program year. Table B-1 shows the number of treatment group homes by cohort and month.

Table B-1: Active Participant Counts by Wave

Month	2012 MR	2015 MR	2021 Digital	2021 Non-Digital	2023 Digital	2023 Non-Digital	2024 Digital 1	2024 Digital 2	2015 LI	2021 LI	2023 LI
Jun 2024	11,246	29,147	53,151	54,419	40,273	13,583	29,708	16,833	6,371	7,773	14,792
Jul 2024	11,215	29,014	52,696	54,042	39,475	13,467	29,064	16,475	6,316	7,655	14,574
Aug 2024	11,180	28,873	52,060	53,591	38,097	13,344	27,815	15,813	6,251	7,527	14,211
Sep 2024	11,142	28,765	51,604	53,192	37,193	13,232	26,989	15,342	6,206	7,411	13,921
Oct 2024	11,107	28,648	51,233	52,894	36,609	13,139	26,491	15,045	6,155	7,306	13,699
Nov 2024	11,069	28,522	50,858	52,551	36,083	13,002	26,054	14,828	6,101	7,209	13,498
Dec 2024	11,035	28,431	50,572	52,264	35,703	12,913	25,735	14,669	6,062	7,119	13,338
Jan 2025	11,003	28,332	50,296	51,991	35,279	12,829	25,436	14,479	6,037	7,045	13,180

Month	2012 MR	2015 MR	2021 Digital	2021 Non-Digital	2023 Digital	2023 Non-Digital	2024 Digital 1	2024 Digital 2	2015 LI	2021 LI	2023 LI
Feb 2025	10,986	28,263	50,074	51,769	34,949	12,738	25,158	14,307	6,004	6,983	13,039
Mar 2025	10,954	28,182	49,836	51,526	34,621	12,667	24,887	14,161	5,964	6,903	12,932
Apr 2025	10,925	28,093	49,569	51,308	34,231	12,575	24,583	13,992	5,922	6,824	12,801
May 2025	10,899	27,983	49,228	51,028	33,835	12,467	24,198	13,765	5,874	6,733	12,624
Average	**11,063**	**28,521**	**50,931**	**52,548**	**36,362**	**12,996**	**26,343**	**14,976**	**6,105**	**7,207**	**13,551**

Source: Guidehouse analysis

B.2 Regression Output

The following tables in Appendix B show the regression results for the eight waves that compose R-BEEP and the three waves that compose LI-BEEP.

Table B-2: Residential Behavioral Wave Regression Savings Details, 2012 – 2021 Waves

Month	2012 MR		2015 MR		2021 D		2021 ND	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2024	-0.88	0.17	-0.38	0.16	-0.29	0.10	-0.29	0.08
Jul 2024	-0.75	0.20	-0.42	0.18	-0.36	0.11	-0.38	0.09
Aug 2024	-0.64	0.18	-0.35	0.16	-0.32	0.10	-0.32	0.08
Sep 2024	-0.57	0.15	-0.31	0.13	-0.26	0.09	-0.26	0.07
Oct 2024	-0.56	0.12	-0.25	0.10	-0.28	0.07	-0.19	0.06
Nov 2024	-0.64	0.13	-0.28	0.11	-0.28	0.08	-0.20	0.06
Dec 2024	-0.94	0.18	-0.26	0.14	-0.36	0.10	-0.16	0.08
Jan 2025	-0.89	0.21	-0.27	0.16	-0.34	0.12	-0.19	0.10
Feb 2025	-0.81	0.20	-0.32	0.15	-0.25	0.11	-0.18	0.09
Mar 2025	-0.69	0.15	-0.36	0.13	-0.15	0.09	-0.18	0.07
Apr 2025	-0.62	0.13	-0.32	0.11	-0.17	0.08	-0.16	0.06
May 2025	-0.58	0.13	-0.30	0.12	-0.24	0.08	-0.15	0.07

Source: Guidehouse analysis

Table B-3: Residential Behavioral Wave Regression Savings Details, 2023-2024 Waves

Month	2023 D		2023 ND		2024 D1		2024 D2	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2024	-0.23	0.08	-0.05	0.08	-0.16	0.10	0.09	0.12
Jul 2024	-0.23	0.12	-0.23	0.10	-0.17	0.11	0.08	0.13
Aug 2024	-0.17	0.11	-0.14	0.09	-0.14	0.09	-0.04	0.11
Sep 2024	-0.20	0.09	-0.07	0.08	-0.03	0.08	-0.07	0.09
Oct 2024	-0.18	0.08	-0.09	0.06	-0.05	0.07	-0.01	0.08
Nov 2024	-0.14	0.08	-0.12	0.07	0.02	0.08	-0.04	0.09
Dec 2024	-0.14	0.11	-0.13	0.09	0.07	0.10	-0.01	0.11
Jan 2025	-0.08	0.12	-0.03	0.10	-0.09	0.11	-0.04	0.13
Feb 2025	-0.03	0.11	-0.07	0.10	-0.11	0.11	-0.05	0.12
Mar 2025	-0.02	0.09	-0.11	0.08	-0.03	0.08	-0.02	0.09
Apr 2025	-0.05	0.07	-0.08	0.06	-0.10	0.07	0.01	0.08
May 2025	-0.10	0.08	-0.05	0.07	-0.08	0.07	0.05	0.08

Source: Guidehouse analysis

Table B-4: LI-BEEP Wave Regression Savings Details

Month	2015 LI		2021 LI		2023 LI	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2024	-0.24	0.29	-0.16	0.18	-0.22	0.13
Jul 2024	-0.16	0.33	-0.04	0.21	-0.10	0.16
Aug 2024	-0.09	0.28	-0.19	0.18	0.03	0.14
Sep 2024	-0.04	0.24	-0.19	0.16	-0.08	0.13
Oct 2024	-0.09	0.20	-0.30	0.17	-0.11	0.11
Nov 2024	-0.22	0.24	-0.17	0.20	-0.11	0.14
Dec 2024	-0.26	0.31	-0.03	0.26	-0.05	0.18
Jan 2025	-0.02	0.36	0.03	0.30	-0.08	0.20
Feb 2025	-0.17	0.35	0.12	0.27	-0.05	0.20
Mar 2025	-0.31	0.28	-0.22	0.20	-0.11	0.15
Apr 2025	-0.27	0.22	-0.28	0.16	-0.18	0.12
May 2025	-0.27	0.21	-0.43	0.15	-0.17	0.11

Source: Guidehouse analysis

Table B-5: Residential Behavioral Wave Regression Savings Percentage Details, 2012 – 2021 Waves

Month	2012 MR		2015 MR		2021 D		2021 ND	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2024	2.34%	0.92%	1.25%	1.03%	1.01%	0.69%	1.20%	0.67%
Jul 2024	1.71%	0.88%	1.18%	0.98%	1.07%	0.64%	1.30%	0.62%
Aug 2024	1.74%	0.93%	1.17%	1.03%	1.12%	0.67%	1.30%	0.66%
Sep 2024	1.90%	0.99%	1.32%	1.10%	1.14%	0.74%	1.31%	0.71%
Oct 2024	2.46%	1.01%	1.39%	1.13%	1.62%	0.86%	1.30%	0.81%
Nov 2024	2.59%	1.00%	1.42%	1.11%	1.52%	0.86%	1.30%	0.80%
Dec 2024	2.96%	1.09%	1.11%	1.16%	1.60%	0.92%	0.83%	0.86%
Jan 2025	2.58%	1.19%	1.07%	1.23%	1.41%	0.98%	0.91%	0.91%
Feb 2025	2.60%	1.23%	1.37%	1.27%	1.14%	0.98%	0.94%	0.92%
Mar 2025	2.79%	1.17%	1.88%	1.31%	0.82%	0.96%	1.15%	0.89%
Apr 2025	2.83%	1.12%	1.91%	1.32%	1.01%	0.95%	1.13%	0.89%
May 2025	2.61%	1.16%	1.70%	1.33%	1.35%	0.95%	1.01%	0.91%

Source: Guidehouse analysis

Table B-6: Residential Behavioral Wave Regression Savings Percentage Details, 2023 – 2024 Waves

Month	2023 D		2023 ND		2024 D1		2024 D2	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2024	0.92%	0.67%	0.31%	0.94%	0.55%	0.68%	-0.30%	0.80%
Jul 2024	0.76%	0.82%	1.12%	0.99%	0.49%	0.62%	-0.22%	0.73%
Aug 2024	0.68%	0.83%	0.83%	1.03%	0.48%	0.64%	0.16%	0.73%
Sep 2024	0.99%	0.88%	0.56%	1.12%	0.13%	0.68%	0.31%	0.79%
Oct 2024	1.13%	0.96%	0.88%	1.17%	0.27%	0.74%	0.03%	0.86%
Nov 2024	0.83%	0.99%	0.99%	1.22%	-0.08%	0.78%	0.22%	0.89%
Dec 2024	0.70%	1.05%	0.89%	1.28%	-0.30%	0.82%	0.05%	0.94%
Jan 2025	0.35%	1.09%	0.22%	1.31%	0.34%	0.83%	0.16%	0.97%
Feb 2025	0.17%	1.11%	0.50%	1.35%	0.48%	0.88%	0.20%	1.02%
Mar 2025	0.15%	1.05%	0.95%	1.28%	0.13%	0.82%	0.09%	0.95%
Apr 2025	0.32%	0.98%	0.82%	1.22%	0.58%	0.75%	-0.07%	0.89%
May 2025	0.62%	0.98%	0.48%	1.23%	0.42%	0.77%	-0.28%	0.92%

Source: Guidehouse analysis

Table B-7: LI-BEEP Wave Regression Savings Percentage Details

Month	2015 LI		2021 LI		2023 LI	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2024	0.94%	2.16%	0.61%	1.33%	0.95%	1.08%
Jul 2024	0.54%	2.12%	0.13%	1.28%	0.38%	1.20%
Aug 2024	0.35%	2.12%	0.71%	1.31%	-0.13%	1.24%
Sep 2024	0.20%	2.19%	0.84%	1.40%	0.44%	1.33%
Oct 2024	0.52%	2.21%	1.66%	1.84%	0.69%	1.45%
Nov 2024	1.10%	2.35%	0.81%	1.93%	0.63%	1.56%
Dec 2024	1.03%	2.48%	0.13%	1.98%	0.24%	1.65%
Jan 2025	0.08%	2.60%	-0.12%	2.05%	0.36%	1.69%
Feb 2025	0.67%	2.67%	-0.46%	2.06%	0.21%	1.76%
Mar 2025	1.50%	2.64%	1.06%	1.91%	0.64%	1.60%
Apr 2025	1.56%	2.46%	1.55%	1.74%	1.17%	1.48%
May 2025	1.57%	2.42%	2.49%	1.71%	1.16%	1.47%

Source: Guidehouse analysis

Table B-8: Behavioral Wave Monthly Regression Savings (MWh/yr)*

Month	2012 MR	2015 MR	2021 Digital	2021 Non-Digital	2023 Digital	2023 Non-Digital	2024 Digital 1	2024 Digital 2	2015 LI	2021 LI	2023 LI
Jun 2024	295	330	461	478	275	21	144	-44	47	38	97
Jul 2024	259	378	590	631	278	95	149	-38	32	10	46
Aug 2024	223	316	518	527	201	58	119	22	18	45	-13
Sep 2024	190	270	406	407	224	30	24	33	8	42	35
Oct 2024	191	222	440	308	199	38	39	2	18	69	46
Nov 2024	214	236	420	320	148	46	-12	18	40	36	45
Dec 2024	321	233	557	255	154	51	-55	5	48	7	21
Jan 2025	304	240	530	303	83	14	68	18	4	-7	35
Feb 2025	248	253	352	258	33	25	80	19	28	-23	17
Mar 2025	233	311	225	282	26	45	20	7	57	47	46
Apr 2025	203	273	248	244	49	32	73	-5	49	58	69
May 2025	197	263	359	233	103	19	57	-21	49	91	68

*Savings are prior to any overlap or persistence adjustments.

Source: Guidehouse analysis

Table B-9: Behavioral Wave Average Daily Use

Wave	Average Daily Use (kWh)
2012 MR	29.4
2015 MR	23.3
2021 Digital	22.2
2021 Non-Digital	18.9
2023 Digital	19.9
2023 Non-Digital	13.8
2024 Digital 1	23.1
2024 Digital 2	22.9
2015 LI	22.7
2021 LI	23.5
2023 LI	19.8

Source: Guidehouse analysis

B.3 Overlap Analysis Detail

To the extent that the behavioral energy efficiency waves increase participation in other programs, some savings from the evaluation's regression analysis could be double-counted if appropriate adjustments are not made. Double-counting can be avoided for downstream programs that track participation at the customer level by generating estimates of uplift—that is, the increase in participation in a given program among R-BEEP and LI-BEEP participants. This is also known as the overlap savings.

To estimate uplift, Guidehouse followed the Phase IV Evaluation Framework guidance on completing dual participation analyses. The Phase IV Evaluation Framework conveys that exposure to the HER messaging often motivates participants to take advantage of other Duquesne Light program offerings that might be promoted through HER promotional materials. This exposure creates a situation where households in the treatment groups tend to participate in other programs at a higher rate than households in the control groups. The Phase IV Evaluation Framework methodology calls for program-specific uplift calculations, and the SWE requests those values be reported.

The evaluation team estimated aggregate uplift across residential programs. From a theoretical standpoint, the program uplift, which is associated with suggestions provided in the HERs, may be allocated to either R-BEEP (or LI-BEEP for the LI behavioral energy efficiency waves) or the other program involved in its realization because the savings would not have occurred in the absence of either program. However, the industry standard approach is to subtract the amount of the overlap savings from the Behavioral Program savings; the team followed this approach. This approach is also consistent with the detailed methodology described in Section 6.1.8.1 of the Phase IV Evaluation Framework.

Guidehouse calculated downstream overlap savings using reported values from other Duquesne Light energy efficiency programs. If those savings exceeded 5% of gross verified HER savings, the evaluation team examined downstream overlap savings at the program and measure level. If a single program, initiative, or measure exceeded 20% of total downstream

double-counted savings and the realization rate for the applicable measure(s) was outside the range of 90% to 110%, the team used the verified savings values (rather than reported savings values) for the applicable measure(s) in the downstream overlap savings calculation. No measures installed in PY16 met these criteria. Verified savings values were applied for energy efficiency kits installed in PY9 and PY10.

Guidehouse's overlap analysis also accounts for upstream programs, in particular the upstream lighting component of the R-BEEP. Calculating overlap savings from upstream programs is complicated by the fact that participation is not tracked at the customer level and the approaches described previously for specific homes are infeasible. Per Section 6.1.8.2 of the Phase IV Evaluation Framework, the team used the Framework's assumed upstream reduction factor dependent on the number of years of activity for the given wave. That reduction factor was subtracted from the estimate of energy savings for each wave after downstream overlap savings had been removed.

Table B-10 shows the upstream reduction factors. Based on feedback from the SWE, Guidehouse adjusted the upstream adjustment factors in PY16 such that factors are capped for newer waves based on their inception date relative to the end of upstream lighting programs in October 2023. Waves beginning after October 2023 are not subject to any upstream adjustments. Table B-11 shows how adjustments are applied to the regression results to arrive at the final verified savings values. Table B-11 also separates incremental first-year savings from persistent savings from prior years, as described in Section 0, in addition to incremental peak demand impacts.

Table B-10: Upstream Adjustment Factors

Years Since Cohort Inception*	Default Upstream Reduction Factor	Waves
<0.5	0.38%	2023 D, 2023 LI, 2023 ND
1	0.75%	
2	1.50%	2021 D, 2021 ND, 2021 LI
3	2.25%	
4 and beyond	3.00%	2012 MR, 2015 LI, 2015 MR, 2018 LI

*Years since cohort inception, prior to the end of upstream lighting programs in October 2023.

Source: Phase IV Evaluation Framework

Table B-11: Savings Adjustments and Final Savings

Wave	Regression Savings (MWh/yr)	Downstream Dual Participation Savings (MWh/yr)	Upstream Dual Participation Savings (MWh/yr)	Persistence (MWh/yr)	Incremental Savings (MWh/yr)	Incremental Peak Demand Savings* (MW/yr)
2012 MR	2,879.61	-475.00	-72.14	-1381.02	951.46	0.19
2015 MR	3,325.97	-1364.55	-58.84	-1207.18	695.39	0.14
2021 Digital	5,105.76	-477.74	-69.42	-3007.81	1,550.79	0.31
2021 Non Digital	4,246.20	-235.97	-60.15	-3179.15	770.93	0.15
2023 Digital	1,771.40	-18.31	-6.57	0.00	1,746.52	0.35
2023 Non Digital	474.09	-8.26	-1.75	0.00	464.09	0.09
2024 Digital 1	706.11	-5.06	0.00	0.00	701.05	0.14
2024 Digital 2	14.74	-3.98	0.00	0.00	10.76	0.00
2015 LI	397.80	-152.25	-7.37	-187.97	50.22	0.01
2021 LI	412.09	-57.68	-5.32	-171.31	177.79	0.04
2023 LI	509.64	-40.04	-1.76	0.00	467.84	0.09

* Column 7 represents incremental peak demand savings after adjusting for transmission and distribution losses.

Source: Guidehouse analysis

B.4 Peak Demand Analysis

To estimate peak demand savings, Guidehouse used an energy-to-demand factor derived from historical load shapes, as described in Section 6.1.6.1 of the Phase IV Evaluation Framework. Guidehouse obtained the historical 8760 reference load shape averaged across all residential customers in the Duquesne Light service territory for the five calendar years including 2017 to 2021. Guidehouse then calculated the reference load shape as total usage for all residential customers divided by the total number of residential customers for each hour of the year. Oracle calculates the reference load shape using customer AMI data provided by Duquesne Light.[29], [30]

From the refence load shape, the peak demand multiplier is calculated by first calculating the average annual load (kW), during all hours and days in the year. Then, average summer peak load (kW), during the TRM-defined peak period of non-holiday weekdays from 2:00 p.m. to 6:00 p.m. in June, July, and August is calculated. Finally, the peak demand multiplier is calculated as the ratio of the average summer peak load to average annual load.

Guidehouse calculated the peak demand multiplier individually for each calendar year, then calculated the 5-year simple average of the peak demand multipliers.

[29] The reference load shape data is calculated from the customer AMI data provided to Oracle by Duquesne Light to be consistent with the data used for selecting tips that appear in the HERs and the billing data used for the energy impact evaluation. Publicly available data, such as that available at https://www.duquesnedsp.com/Documents/LoadandOtherData.aspx, may undergo a different data cleaning process.

[30] The reference load shape data was 99.7% complete. Missing observations tended to occur in groups by day (e.g., all 24 hours of a day were missing). Guidehouse identified eight observations with an abnormally high customer count and 89 observations with an abnormally low customer count, representing 0.2% of all observations. Guidehouse did not remove these observations from the calculation.

Values for average annual load, average summer peak load, and peak demand multiplier from 2017 to 2021 are presented in Table B-12.

Table B-12: Peak Demand Multiplier, 2017 to 2021

Year	Average Annual Load (kW)	Average Summer Peak Load (kW)	Peak Demand Multiplier
2017	0.88	1.37	1.57
2018	0.93	1.40	1.50
2019	0.89	1.39	1.57
2020	0.91	1.67	1.83
2021	0.92	1.54	1.67
5-Year Average	**0.91**	**1.48**	**1.63**

Source: Guidehouse analysis

Because the methodology uses the same reference load shape for all R-BEEP and LI-BEEP cohorts, the peak demand multiplier will be identical for all cohorts throughout Phase IV. The Phase IV Duquesne Light peak demand multiplier is 1.63.

Appendix C. PY16 and P4TD Summary by Customer Segment and LI Carveout

Table C-1 presents a summary of the programs, components/initiatives, and customer segments that contribute to the LI carveout in PY16 and P4TD.

Table C-1: Summary of LI Carveout Energy Savings (MWh/yr)

Program	Customer Segment	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
LIEEP	LI	2,417	9,423
LI-BEEP	LI	696	2,853
SBDI*	Small Business Multifamily	195	1,617
LBS- Commercial	Large Business Multifamily	-	221
Total	-	**3,308**	**14,115**

* It was discovered that the PY14 Annual Report was underreporting the LI savings for Small Business Multifamily by 10 MWh. Those savings have been added to the VTD Gross savings in this table.

Source: Guidehouse analysis

Appendix D. Summary of Program-Level Impacts, Cost-Effectiveness and HIM NTG

D.1 Program and Component-Level Impacts Summary

A summary of energy impacts by program and component through PY16 are presented in Table D-1.

Table D-1: Incremental Annual Energy Savings by Program & Component (MWh/yr)

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential Downstream Incentives	Rebates	1,495	1,961	1,608	2,670	3,284	2,693
Residential Downstream Incentives	Audits	186	167	201	1,029	989	1,079
Residential Downstream Incentives	Kits	5,376	5,800	4,640	12,424	12,405	9,677
Residential Downstream Incentives	Spray Foam	300	324	260	300	324	260
Residential Downstream Incentives	New Customer Kits - Outlet Gasket	425	99	80	425	99	80
Residential Downstream Incentives	New Customer Kits - Furnace Whistle	187	2	2	187	2	2
Residential Downstream Incentives	New Customer Kit - Nightlights	509	1,395	1,116	509	1,395	1,116
Residential Downstream Incentives	New Customer Kits - LEDs	4,618	3,687	2,950	4,618	3,687	2,950
Residential Midstream Incentives		-	-	-	7	7	7
Residential Upstream Incentives	Appliances	-	-	-	3,819	4,532	3,561
Residential Upstream Incentives	LEDs	-	-	-	2,937	2,924	1,547
Residential Appliance Recycling	Freezers	141	128	92	621	577	337

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential Appliance Recycling	Refrigerators	1,034	1,050	753	3,823	4,162	2,454
Residential Appliance Recycling	Other	232	243	174	587	604	377
Residential Low Income Energy Efficiency	Audits	2,238	2,184	2,184	8,055	7,506	7,506
Residential Low Income Energy Efficiency	Kits	-	-	-	923	914	914
Residential Low Income Energy Efficiency	Giveaways	31	31	31	90	90	90
Residential Low Income Energy Efficiency	Appliance Recycling	163	202	202	854	914	914
Residential Behavioral		6,956	6,891	6,891	28,148	27,635	27,635
Low Income Behavioral		549	696	696	2,539	2,853	2,853
Small Business Direct Install	Large	-	-	-	6,374	5,748	5,349
Small Business Direct Install	Medium	-	-	-	1,236	1,013	937
Small Business Direct Install	Small	-	-	-	1,285	1,300	1,235
Small Business Direct Install	MF	277	274	255	1,242	1,285	1,233
Small Business Direct Install	MF LI	196	195	181	980	971	923
Small Business Direct Install	PAPP	-	-	-	96	111	110
Small Business Solutions	Large	840	773	510	840	773	510
Small Business Solutions	Medium	2,543	2,545	1,680	12,438	11,853	7,982
Small Business Solutions	Small	2,553	2,239	1,478	14,364	16,495	11,795
Small Business Solutions	Upstream Lighting-CCS	-	-	-	524	523	276
Small Business Midstream Solutions	Large	-	-	-	16,634	19,148	13,019
Small Business Midstream Solutions	Medium	-	-	-	30,418	33,202	22,826

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Small Business Midstream Solutions	Small	-	-	-	5,809	5,082	3,538
Small Business Virtual Commissioning		101	100	94	2,860	2,804	2,658
Large Business Solutions	Commercial - Certainty	3,319	3,110	2,794	10,835	10,603	6,016
Large Business Solutions	Commercial - Large	12,634	12,193	10,956	19,493	19,423	15,361
Large Business Solutions	Commercial - Medium	5,641	5,370	4,825	16,413	16,347	11,372
Large Business Solutions	Commercial - Small	545	533	479	3,580	4,048	2,602
Large Business Solutions	Commercial - MF LI	-	-	-	175	221	95
Large Business Solutions	Industrial - Certainty	-	-	-	21,310	21,821	9,383
Large Business Solutions	Industrial - Large	1,877	2,017	1,812	4,443	4,575	3,057
Large Business Solutions	Industrial - Medium	407	388	349	2,944	2,731	1,492
Large Business Solutions	Industrial - Small	184	180	161	641	628	418
Large Business Midstream Solutions	Commercial - Large	4,960	7,691	6,768	9,521	13,816	11,152
Large Business Midstream Solutions	Commercial - Medium	2,751	4,376	3,851	9,790	11,593	9,246
Large Business Midstream Solutions	Commercial - Small	1,085	3,364	2,961	3,252	6,086	5,037
Large Business Midstream Solutions	Industrial - Large	746	537	472	11,800	15,034	10,333
Large Business Midstream Solutions	Industrial - Medium	539	857	754	4,218	4,681	3,493
Large Business Midstream Solutions	Industrial - Small	140	190	167	630	865	652
Large Business Virtual Commissioning		244	238	223	4,165	4,051	3,950
Portfolio Total*		**66,024**	**72,031**	**62,649**	**292,874**	**311,736**	**232,102**

*Totals might not match other tables in this report due to rounding

Source: Guidehouse analysis

A summary of the peak demand impacts by energy efficiency program and Component through the current reporting period are presented in Table D-2.

Table D-2: Peak Demand Savings by Energy Efficiency Program & Component (MW/yr)

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Downstream Incentives	Rebates	0.26	0.22	0.18	1.02	0.84	0.69
Residential Downstream Incentives	Audits	0.02	0.02	0.02	0.09	0.09	0.10
Residential Downstream Incentives	Kits	0.82	0.81	0.65	1.98	1.95	1.49
Residential Downstream Incentives	Spray Foam	0.00	0.00	0.00	0.00	0.00	0.00
Residential Downstream Incentives	New Customer Kits - Outlet Gasket	0.00	0.00	0.00	0.00	0.00	0.00
Residential Downstream Incentives	New Customer Kits - Furnace Whistle	0.10	-	-	0.10	-	-
Residential Downstream Incentives	New Customer Kit - Nightlights	-	-	-	-	-	-
Residential Downstream Incentives	New Customer Kits - LEDs	0.50	0.38	0.31	0.50	0.38	0.31
Residential Midstream Incentives		-	-	-	0.00	0.00	0.00
Residential Upstream Incentives	Appliances	-	-	-	0.64	1.07	0.85
Residential Upstream Incentives	LEDs	-	-	-	0.33	0.33	0.17
Residential Appliance Recycling	Freezers	0.02	0.02	0.02	0.11	0.10	0.05
Residential Appliance Recycling	Refrigerators	0.18	0.18	0.13	0.66	0.73	0.43
Residential Appliance Recycling	Other	0.17	0.19	0.14	0.43	0.46	0.28
Residential Low Income Energy Efficiency	Audits	0.16	0.16	0.16	0.73	0.68	0.68

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Low Income Energy Efficiency	Kits	-	-	-	0.08	0.08	0.08
Residential Low Income Energy Efficiency	Giveaways	0.00	0.00	0.00	0.00	0.00	0.00
Residential Low Income Energy Efficiency	Appliance Recycling	0.03	0.04	0.04	0.15	0.16	0.16
Residential Behavioral		1.95	1.38	1.38	5.48	4.72	4.72
Low Income Behavioral		0.07	0.14	0.14	0.26	0.41	0.41
Small Business Direct Install	Large	-	-	-	1.04	1.04	0.96
Small Business Direct Install	Medium	-	-	-	0.19	0.19	0.17
Small Business Direct Install	Small	-	-	-	0.21	0.22	0.21
Small Business Direct Install	MF	0.04	0.06	0.06	0.32	0.36	0.34
Small Business Direct Install	MF LI	0.03	0.04	0.04	0.10	0.15	0.14
Small Business Direct Install	PAPP	-	-	-	0.02	0.03	0.03
Small Business Solutions	Large	0.11	0.09	0.06	0.11	0.09	0.06
Small Business Solutions	Medium	0.50	0.45	0.30	2.68	2.47	1.66
Small Business Solutions	Small	0.54	0.50	0.33	3.11	4.40	3.20
Small Business Solutions	Upstream Lighting-CCS	-	-	-	0.15	0.16	0.08
Small Business Midstream Solutions	Large	-	-	-	3.82	3.63	2.47
Small Business Midstream Solutions	Medium	-	-	-	6.45	8.05	5.55
Small Business Midstream Solutions	Small	-	-	-	1.12	1.09	0.77
Small Business Virtual Commissioning		0.00	0.00	0.00	0.49	0.54	0.51
Large Business Solutions	Commercial - Certainty	0.88	0.87	0.78	2.57	2.22	1.36
Large Business Solutions	Commercial - Large	2.37	2.60	2.33	3.83	4.02	3.11

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Large Business Solutions	Commercial - Medium	1.05	1.10	0.99	3.22	3.35	2.40
Large Business Solutions	Commercial - Small	0.14	0.14	0.12	0.66	0.91	0.63
Large Business Solutions	Commercial - MF LI	-	-	-	0.02	0.03	0.01
Large Business Solutions	Industrial - Certainty	-	-	-	1.94	1.99	0.85
Large Business Solutions	Industrial - Large	0.19	0.17	0.16	0.50	0.46	0.29
Large Business Solutions	Industrial - Medium	0.07	0.07	0.06	0.52	0.53	0.29
Large Business Solutions	Industrial - Small	0.04	0.04	0.04	0.15	0.15	0.10
Large Business Midstream Solutions	Commercial - Large	1.03	2.09	1.84	1.89	2.91	2.42
Large Business Midstream Solutions	Commercial - Medium	0.50	0.73	0.65	1.81	2.27	1.81
Large Business Midstream Solutions	Commercial - Small	0.22	0.60	0.53	0.68	1.11	0.92
Large Business Midstream Solutions	Industrial - Large	0.18	0.16	0.14	2.78	2.60	1.80
Large Business Midstream Solutions	Industrial - Medium	0.16	0.24	0.21	1.04	1.25	0.94
Large Business Midstream Solutions	Industrial - Small	0.03	0.04	0.03	0.13	0.15	0.12
Large Business Virtual Commissioning		-	-	-	0.43	0.59	0.58
Portfolio Total*		**12.40**	**13.54**	**11.82**	**54.56**	**58.95**	**44.20**

*Totals might not match other tables in this report due to rounding

Source: Guidehouse analysis

D.2 Program-Level Cost-Effectiveness Summary

Table D-3 shows the TRC ratios by program and for the portfolio. The benefits in Table D-3 were calculated using gross verified impacts. Costs and benefits are expressed in 2024 dollars.

Table D-3: PY16 Gross TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$7,299	$4,252	1.72	$3,047
Res Midstream Incentives	$0	$0	0.00	$0
Res Upstream Lighting	$0	$73	0.00	($73)
Appliance Recycling	$353	$262	1.35	$91
Low-Income Energy Efficiency	$877	$521	1.68	$356
Res Behavioral EE	$683	$955	0.72	($272)
Low-Income Behavioral EE	$69	$224	0.31	($155)
Residential Subtotal	**$9,281**	**$6,287**	**1.48**	**$2,994**
Small Business Direct Install	$314	$286	1.10	$28
Small Business Downstream	$3,691	$2,145	1.72	$1,547
Small Business Midstream	$0	$176	0.00	($176)
Small Business VCx	$27	$47	0.57	($20)
Large Commercial Downstream	$14,766	$8,357	1.77	$6,409
Large Commercial Midstream	$10,963	$2,135	5.14	$8,829
Large Commercial VCx	$62	$63	0.99	($1)
Large Industrial Downstream	$1,487	$659	2.26	$828
Large Industrial Midstream	$1,189	$323	3.68	$865
Large Industrial VCx	$0	$19	0.00	($19)
Nonresidential Subtotal	**$32,500**	**$14,210**	**2.29**	**$18,290**
Portfolio Total	**$41,782**	**$20,497**	**2.04**	**$21,284**

[1] Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: Guidehouse analysis

Table D-4 presents PY16 cost-effectiveness using net verified savings to calculate benefits.

Table D-4: PY15 Net TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$5,897	$3,613	1.63	$2,284
Res Midstream Incentives	$0	$0	0.00	$0
Res Upstream Lighting	$0	$73	0.00	($73)
Appliance Recycling	$253	$232	1.09	$21
Low-Income Energy Efficiency	$877	$521	1.68	$356
Res Behavioral Energy Efficiency	$683	$955	0.72	($272)
Low-Income Behavioral Energy Efficiency	$69	$224	0.31	($155)
Residential Subtotal	**$7,779**	**$5,618**	**1.38**	**$2,161**
Small Business Direct Install	$292	$277	1.05	$15
Small Business Downstream	$2,436	$1,683	1.45	$753
Small Business Midstream	$0	$176	0.00	($176)
Small Business VCx	$25	$47	0.54	($22)
Large Commercial Downstream	$13,268	$7,727	1.72	$5,541
Large Commercial Midstream	$9,648	$1,966	4.91	$7,682
Large Commercial VCx	$58	$63	0.93	($5)
Large Industrial Downstream	$1,336	$632	2.11	$704
Large Industrial Midstream	$1,046	$299	3.49	$746
Large Industrial VCx	$0	$19	0.00	($19)
Nonresidential Subtotal	**$28,111**	**$12,891**	**2.18**	**$15,220**
Portfolio Total	**$35,890**	**$18,508**	**1.94**	**$17,382**

[1] Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: Guidehouse analysis

Table D-5 summarizes cost-effectiveness by program for Phase IV of Act 129. Cost and benefits are expressed in 2021 dollars.

Table D-5: P4TD Gross TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$10,732	$8,095	1.33	$2,636
Res Midstream Incentives	$6	$125	0.05	($119)
Res Upstream Lighting	$3,164	$3,752	0.84	($588)
Appliance Recycling	$1,105	$2,042	0.54	($937)
Low-Income Energy Efficiency	$2,555	$2,899	0.88	($344)
Res Behavioral Energy Efficiency	$2,206	$2,560	0.86	($354)
Low-Income Behavioral Energy Efficiency	$213	$856	0.25	($643)
Residential Subtotal	**$19,980**	**$20,329**	**0.98**	**($350)**
Small Business Direct Install	$6,335	$4,121	1.54	$2,214
Small Business Downstream	$18,917	$7,452	2.54	$11,465
Small Business Midstream	$36,530	$17,734	2.06	$18,796
Small Business VCx	$1,638	$286	5.72	$1,352
Large Commercial Downstream	$29,842	$15,755	1.89	$14,086
Large Commercial Midstream	$18,773	$6,007	3.13	$12,766
Large Commercial VCx	$2,208	$296	7.47	$1,912
Large Industrial Downstream	$13,721	$6,953	1.97	$6,768
Large Industrial Midstream	$11,764	$3,820	3.08	$7,943
Large Industrial VCx	$0	$109	0.00	($109)
Nonresidential Subtotal	**$139,727**	**$62,533**	**2.23**	**$77,193**
Portfolio Total	**$159,707**	**$82,863**	**1.93**	**$76,844**

[1] Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: Guidehouse analysis

Table D-6 presents P4TD cost-effectiveness results using net verified savings to calculate benefits. Cost and benefits are expressed in 2021 dollars.

Table D-6: P4TD Net TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$8,628	$7,253	1.19	$1,375
Res Midstream Incentives	$6	$125	0.05	($119)
Res Upstream Lighting	$2,129	$3,146	0.68	($1,017)
Appliance Recycling	$651	$1,913	0.34	($1,261)
Low-Income Energy Efficiency	$2,555	$2,899	0.88	($344)
Res Behavioral Energy Efficiency	$2,206	$2,560	0.86	($354)
Low-Income Behavioral Energy Efficiency	$213	$856	0.25	($643)
Residential Subtotal	**$16,387**	**$18,751**	**0.87**	**($2,364)**
Small Business Direct Install	$5,935	$3,937	1.51	$1,999
Small Business Downstream	$13,276	$6,061	2.19	$7,214
Small Business Midstream	$25,074	$13,443	1.87	$11,631
Small Business VCx	$1,554	$286	5.43	$1,268
Large Commercial Downstream	$20,946	$12,595	1.66	$8,351
Large Commercial Midstream	$15,146	$5,145	2.94	$10,001
Large Commercial VCx	$2,161	$296	7.31	$1,865
Large Industrial Downstream	$6,670	$4,723	1.41	$1,946
Large Industrial Midstream	$8,310	$3,096	2.68	$5,213
Large Industrial VCx	$0	$109	0.00	($109)
Nonresidential Subtotal	**$99,072**	**$49,691**	**1.99**	**$49,380**
Portfolio Total	**$115,459**	**$68,443**	**1.69**	**$47,016**

[1] Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: Guidehouse analysis

D.3 HIM NTG

Findings from NTG research are not used to adjust compliance savings in Pennsylvania. Instead, NTG research provides directional information for program planning purposes. HIMs research was not conducted in PY16. [31]

D.4 Program-Level Comparison of Performance to Approved EE&C Plan

Table D-7 presents PY16 expenditures, by program, compared with the budget estimates set forth in the EE&C plan for PY16. All the dollars in Table D-7 are presented in 2024 dollars.

Table D-7: Comparison of PY16 Expenditures to Phase IV EE&C Plan ($1,000)

Program	PY16 Budget from EE&C Plan	PY16 Actual Expenditures	Ratio (Actual/Plan)
Res Downstream Incentives	$1,938	$3,377	1.74
Res Midstream Incentives	$72	$0	0.00
Res Upstream Lighting	$301	$63	0.21
Appliance Recycling	$632	$248	0.39
Low-Income Energy Efficiency	$3,184	$3,004	0.94
Res Behavioral Energy Efficiency	$724	$945	1.30
Low-Income Behavioral Energy Efficiency	$129	$222	1.73
Small Business Direct Install	$640	$133	0.21
Small Business Downstream	$1,923	$1,283	0.67
Small Business Midstream	$240	$176	0.73
Small Business VCx	$24	$51	2.14
Large Commercial Downstream	$5,447	$4,193	0.77
Large Commercial Midstream	$867	$1,592	1.84
Large Commercial VCx	$28	$108	3.88
Large Industrial Downstream	$940	$517	0.55
Large Industrial Midstream	$140	$203	1.45
Large Industrial VCx	$134	$24	0.18
TOTAL	**$17,361**	**$16,139**	**0.93**

Source: Guidehouse analysis

[31] The Phase IV Evaluation Framework provides guidance to the EDCs to oversample measure categories (technologies) of high importance, called HIMs, to help program planners make decisions concerning those measures. The SWE suggests that for each program year, each EDC identify three to five HIMs for study based on energy impact, level of uncertainty, prospective value, funding, or other parameters. The intent is to prioritize measure-level NTGRs for HIMs, but the EDCs are encouraged to also provide program-level NTG information (i.e., to oversample HIMs), but they may also include non-HIMs in the research, as appropriate.

Table D-8 presents P4TD expenditures, by program, compared with the budget estimates set forth in the EE&C plan through PY16. All the dollars in Table D-8 are presented in nominal dollars.

Table D-8: Comparison of P4TD Expenditures to Phase IV EE&C Plan ($1,000)

Program	Phase IV Budget from EE&C Plan through PY16	P4TD Actual Expenditures	Ratio (Actual/Plan)
Res Downstream Incentives	$5,527	$8,248	1.49
Res Midstream Incentives	$157	$109	0.69
Res Upstream Lighting	$2,397	$2,686	1.12
Appliance Recycling	$1,888	$2,131	1.13
Low-Income Energy Efficiency	$10,446	$8,976	0.86
Res Behavioral Energy Efficiency	$2,611	$2,816	1.08
Low-Income Behavioral Energy Efficiency	$564	$943	1.67
Small Business Direct Install	$4,241	$6,705	1.58
Small Business Downstream	$7,486	$5,315	0.71
Small Business Midstream	$11,803	$12,494	1.06
Small Business VCx	$601	$610	1.01
Large Commercial Downstream	$14,019	$9,875	0.70
Large Commercial Midstream	$4,943	$4,872	0.99
Large Commercial VCx	$915	$981	1.07
Large Industrial Downstream	$5,309	$4,791	0.90
Large Industrial Midstream	$4,613	$3,421	0.74
Large Industrial VCx	$267	$122	0.46
TOTAL	**$77,787**	**$75,096**	**0.97**

Source: Guidehouse analysis

Table D-9 compares PY16 verified gross program savings compared with the energy savings projections set forth in the EE&C plan.

Table D-9: Comparison of PY15 Actual Program Savings to EE&C Plan Projections for PY16

Program	EE&C Plan Projections for PY16	PY16 VTD Gross MWh Savings	Ratio (Actual/Plan)
Res Downstream Incentives	7,559	13,437	1.78
Res Midstream Incentives	129	0	0.00
Res Upstream Lighting	485	0	0.00
Appliance Recycling	1,715	1,422	0.83
Low-Income Energy Efficiency	3,778	2,417	0.64
Res Behavioral Energy Efficiency	8,643	6,891	0.80
Low-Income Behavioral Energy Efficiency	865	696	0.80
Small Business Direct Install	694	469	0.68
Small Business Downstream	8,481	5,558	0.66
Small Business Midstream	897	0	0.00
Small Business VCx	63	100	1.58
Large Commercial Downstream	27,264	21,206	0.78
Large Commercial Midstream	2,768	15,431	5.57
Large Commercial VCx	112	238	2.12
Large Industrial Downstream	4,658	2,585	0.55
Large Industrial Midstream	496	1,583	3.19
Large Industrial VCx	532	0	0.00
TOTAL	**69,136**	**72,031**	**1.04**

Source: Guidehouse analysis

Table D-10 compares Phase IV verified gross program savings with the energy savings projections set forth in the EE&C plan.

Table D-10: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV

Program	EE&C Plan Through PY16	VTD Gross MWh Savings	Ratio (Actual/Plan)
Res Downstream Incentives	17,106	22,187	1.30
Res Midstream Incentives	241	7	0.03
Res Upstream Lighting	3,869	7,456	1.93
Appliance Recycling	5,289	5,344	1.01
Low-Income Energy Efficiency	12,394	9,424	0.76
Res Behavioral Energy Efficiency	31,155	27,635	0.89
Low-Income Behavioral Energy Efficiency	3,790	2,853	0.75
Small Business Direct Install	4,593	10,428	2.27
Small Business Downstream	33,014	29,645	0.90

Program	EE&C Plan Through PY16	VTD Gross MWh Savings	Ratio (Actual/Plan)
Small Business Midstream	44,047	57,431	1.30
Small Business VCx	1,602	2,804	1.75
Large Commercial Downstream	70,171	50,643	0.72
Large Commercial Midstream	15,791	31,495	1.99
Large Commercial VCx	3,679	4,051	1.10
Large Industrial Downstream	26,306	29,755	1.13
Large Industrial Midstream	16,288	20,580	1.26
Large Industrial VCx	1,063	0	0.00
TOTAL	**290,397**	**311,736**	**1.07**

Source: Guidehouse analysis

Appendix E. Evaluation Detail

E.1 Large and Small Business Solutions

Guidehouse evaluated the SBS and LBS (C&I) programs individually. Guidehouse calculated the minimum sample size needed to achieve at least 15% relative precision at 85% confidence level for calculating verified energy and demand savings. The population counts and sample sizes for the initiative are based on counts of unique projects identified by a unique Job ID (project) in the tracking database.

Guidehouse applied stratification based on total energy savings and assigned each project to various strata based on that project's energy savings. The large stratum includes projects in the upper portion of the program component's energy savings; the medium stratum includes projects in the middle portion of the energy savings; and the small stratum represents the bottom portion of the energy savings.

Table E-1: LBS and SBS Sample Design

Stratum	Stratum Boundaries	Population (Projects)	Historical CV (Energy)	Historical CV (Demand)	Sampled Projects (Inc PY15)
LBS - Certainty	MWh ≥ 1,000	1	0.02	0.31	4
LBS - Large	500 ≤ MWh < 1,000	16	0.02	-	9
LBS - Medium	100 ≤ MWh < 500	26	0.03	0.07	9
LBS - Small	MWh < 100	20	0.08	0.20	6
LBS Program Total		**63**			**28**
SBS - Large	MWh > 500	2	-	-	4
SBS - Medium	100 ≤ MWh < 500	25	0.13	0.63	7
SBS - Small	MWh < 100	148	0.19	0.06	8
SBS Program Total		**175**			**19**

Source: Guidehouse analysis

Table E-2: LBS and SBS Initiative Results (Energy)

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBS - Large	840	92%	-	0%
SBS - Medium	2,543	100%	0.08	5%
SBS - Small	2,553	88%	0.47	27%

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBS Program Total	**5,936**	**94%**	**0.19**	**10%**
LBS – Certainty (Commercial)	3,319	94%	-	0%
LBS – Large (Commercial)	12,634	97%	0.08	6%
LBS – Medium (Commercial)	5,641	95%	0.10	5%
LBS – Small (Commercial)	545	98%	0.07	5%
LBS – Certainty (Industrial)	-	112%	-	0%
LBS – Large (Industrial)	1,877	107%	0.14	18%
LBS – Medium (Industrial)	407	95%	0.10	5%
LBS – Small (Industrial)	184	98%	0.07	5%
LBS Program Total	**24,608**	**97%**	**0.05**	**3%**

Source: Guidehouse analysis

Table E-3: LBS and SBS Initiative Results (Demand)

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBS - Large	0.11	76%	-	-
SBS - Medium	0.50	90%	0.15	10%
SBS - Small	0.54	93%	0.53	30%
SBS Program Total	**1.15**	**90%**	**0.26**	**14%**
LBS – Certainty (Commercial)	0.88	99%	-	0%
LBS – Large (Commercial)	2.37	109%	0.22	16%
LBS – Medium (Commercial)	1.05	104%	0.12	6%
LBS – Small (Commercial)	0.14	100%	0.18	13%
LBS – Large (Industrial)	0.19	90%	0.15	20%
LBS – Medium (Industrial)	0.07	104%	0.12	6%
LBS – Small (Industrial)	0.04	100%	0.18	13%
LBS Program Total	**4.75**	**105%**	**0.12**	**7%**

Source: Guidehouse analysis

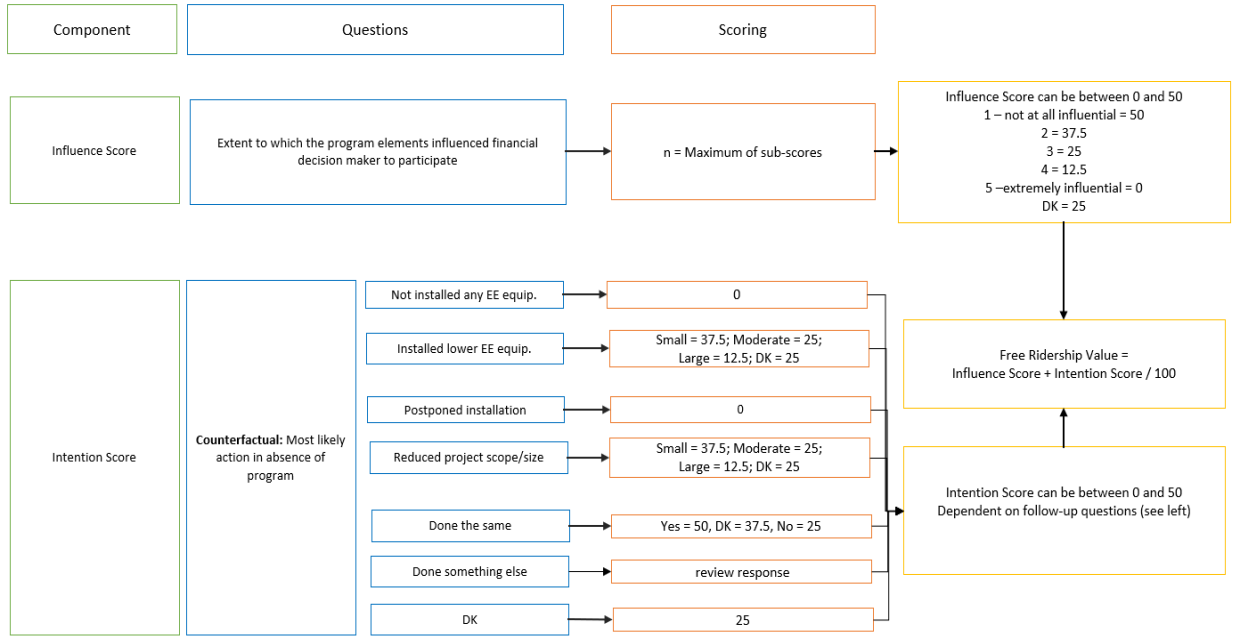
Appendix F. Free Ridership Evaluation for Large Business Solutions Program

This section describes the evaluation method that Guidehouse used for assessing free ridership for LBS. This methodology follows the general guidelines provided in the SWE's Phase IV Evaluation Framework. Guidehouse estimated free ridership for LBS based on results from the online participant survey. Based on participant responses, Guidehouse estimated the Program Influence score and an Intention score. The obtained free ridership estimates for each respondent were then weighted by their energy savings claimed in PY16. Figure F-1 shows how each respondent's free ridership was determined.

- **Program Influence score**: An estimate of the program's influence on the participant's decision to carry out the energy-efficiency project.

- **Intention score**: An estimate of the percentage of energy savings that would have been claimed by the respondent if the program did not exist. This score is estimated based on counterfactual questions used to determine what actions the participant would have taken if the program was not available.

Figure F-1: Free Ridership Protocol



Source: Guidehouse analysis

Appendix G. Respondent Demographics and Firmographics

Table G-1 shows respondents' firmographics for the LBS participant survey conducted in PY16.

Table G-1: PY16 Survey Firmographics for Nonresidential Programs

Program		LBS	
Sample Size (n)		5	
		Count	%
Facility type	Office	0	0%
	Retail	1	20%
	Restaurant/bar	0	0%
	Food store	0	0%
	Warehouse/wholesale	0	0%
	Hotel/motel	0	0%
	Personal service	0	0%
	Elementary/secondary schools	0	0%
	College/trade schools	1	20%
	Hospital	0	0%
	Other health services	0	0%
	Miscellaneous/other commercial	1	20%
	Government service/public service	1	20%
	Manufacturing	1	20%
	Apartment complexes	0	0%
	Other	0	0%
	Don't know	0	0%
	Prefer not to answer	0	0%
Ownership	I am the owner or operator of the facility	1	20%
	Our organization owns and occupies this facility	3	60%
	Our organization owns this facility, but it is rented to someone else	0	0%
	Our organization rents this facility	0	0%
	Other	1	20%
	Don't know	0	0%
Facility Age	Less than 2 years	0	0%
	2 to 4 years	0	0%
	5 to 9 years	0	0%
	10 to 19 years	1	20%

Program		LBS	
	20 to 29 years	0	0%
	30 years or more	4	80%
	Don't know	0	0%
Employees	1 to 4 employees	1	20%
	5 to 9 employees	0	0%
	10 to 19 employees	1	20%
	20 to 99 employees	0	0%
	100 to 499 employees	3	60%
	500 to 749 employees	0	0%
	750 to 999 employees	0	0%
	1,000 employees or more	0	0%
	Don’t know	0	0%
	Prefer not to answer	0	0%

Source: Guidehouse analysis